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SHELLS FROM MIDWAY

By DR. V. D. P. SPICER

During the current program of defense construction, the Midway Islands, formerly isolated sand bars on a coral reef, and serving as a cable station and over-night stop for trans-Pacific clippers, have been selected for extensive development by the Navy Department. A large force of construction laborers have been employed for periods upward of a year. Lacking other entertainment they have become shell collectors. The beaches are being as thoroughly explored and patrolled as at Waikiki or Palm Beach. The screens and conveyer belts at the aggregate plant where coral heads from the lagoon floor are broken up for inclusion in the concrete foundations, are always lined with eagle-eyed shell collectors. As a result many shells are being carried away from Midway.

The Guam boys employed at the Pan-Air Hotel have taken advantage of this shell enthusiasm by importing large numbers of colorful Guam shells and selling them to the construction employees. These Guam shells are being mixed indiscriminately with the Midway shells, and some may eventually gravitate to museums and collectors bearing a Midway label. There is enough similarity between the molluscan fauna of Midway and Guam that one not familiar with the shells of both places could easily overlook such an error. In view of this possible confusion I have checked the collections being made and prepared the appended lists of Midway and Guam shells. I am fortunately situated in being on the only vessel regularly serving Midway, and the returning personnel must travel with us. I have been able to inspect practically all shell collections on or returning from Midway.

Guam shells being sold on Midway

Cypraea caputserpentis
annulus
moneta
caurica
intermedia
talpa
lynx
carneola
isabella
erosa
argus
mappa
Cypraea tigris
mauritiana
arabica
vitellus
Pterocera bryonia
lambis
chiragra
Conus striatus
Turbo petholatus
Oliva erythrostoma
Partula gibba

Shells being brought from Midway and collected there

Cypraea tesselata
isabella
madagascariensis
sulcidentata
scurra
helvola
fimbriata
semiplota
ostergaardi
Cassis kalosmodix
vibex
Dolium perdix
melanostoma
pomum
Alectrion hirtus
Nassa sertum
Nerita picea
Littorina pinctada
Lioconcha hieroglyphica
Tellina crassiplicata
Pharaonella venusta
Charonia tritonis
Cymatium chlorostoma
Polinices mamilla
Distorsio anus
Bursa affinis
Mitra cucumerina
Cerithium mutatum
Cerithium obeliscus
columna
Conus literatus millepunctatus
lividus
flavidus
cingulum
nanus
abbreviatus
nussatella
striatus
cylindraceus
vitulinus
clavus dactylosus
Drupa digitata (abundant)
ricinus (rare)
Turbo intercostalis
Trochus sandwichensis
Terebra maculata
gouldii
crenulata
chlorata
spauldingae
Strombus hawaiiensis
maculatus
gibberulus
Rhizochilus madreporarum
Coralliophila neritoidea
Columbella livescens
varians
turturina
Modulus tectum

FURTHER NOTES ON THE FOOD OF THE LIMPKIN

By FRANCIS HARPER

Since the publication of recent papers on this subject (Cottam, 1936; Harper, 1936a, 1936b), some additional information has come to hand.

Bryant (1859, p. 13), in discussing the feeding habits of the Limpkin (*Aramus scolopaceus pictus*), as observed by him at Lake Dexter or on neighboring portions of the St. John's River in Florida, says: "On the St. Johns it feeds principally on a species of Natica, which is extremely abundant, and also on the small Unios. The large green snail [Pomacea], so common in the everglade, is not very often met with on the St. Johns."

This report of *Natica* was accepted without question by Cottam (1936, p. 12). However, Dr. H. A. Pilsbry and Mr. Richard A. McLean have called my attention to the fact that *Natica* is a marine mollusk, whose occurrence as far up the St. John's as Lake Dexter is out of the question. The most abundant component of the shell mounds in the vicinity of Lake Dexter is *Viviparus georgianus,* and apparently this is the animal that Bryant should have recorded instead of *Natica*. It does not seem to have been included in any other report on the food of the Limpkin.

Additional though purely circumstantial evidence on this point has come from the single locality in Georgia where the Limpkin is known to occur at present with any degree of regularity—Mill Creek, a tributary of the St. Mary's River in extreme southwestern Camden County. Here Frederick V. Hebard and I have failed to find any trace of *Pomacea,* the staple food of the Limpkin in nearly all parts of its range, but in the spring of 1940 John W. Burch collected a number of specimens of *Viviparus georgianus.* Cottam reports (1936, p. 12, and *in litt.,* January 9, 1941) that a Limpkin collected at Bassenger on the Kissimmee River, Florida, had eaten at least ten individuals of the genus *Campeloma.* Since this mollusk and *Viviparus georgianus* are members of the same family (Viviparidae), and since they are also of about the same size and shape, it would appear quite likely that the latter serves as a mainstay for the Limpkin in Camden County, Georgia, especially in view of the apparent absence or at least scarcity of *Pomacea* in that locality.

The foregoing evidence on the Limpkin's utilization of *Viviparus* raises the question whether this bird, as well as aboriginal man, may not have played a part in the gradual building up of the vast shell mounds along the St. John's. A point remaining to be investigated, however, is whether or not the Limpkin breaks the shell of *Viviparus* in order to secure the fleshy parts. A very large proportion of these shells in the mounds along the St. John's appear to be more or less intact. It does not break the shell of *Pomacea*.

Mr. Francis M. Weston (*in litt.*, May 8, 1938) calls my attention to the fact that in my previous paper (1936b, p. 39) Spring Creek was erroneously placed west, instead of east, of Marianna, Fla. He adds: "You might be interested to know that the Limpkin not only occurs but also nests in the upper reaches of that creek. I have also found the Limpkin nesting some miles west of Marianna, at least nine miles west of Spring Creek. . . . There seems to be no good reason why Pomacea and the Limpkin should not be found in the S. E. corner of Alabama and the S. W. corner of Georgia."

Hitherto the western limit of the Limpkin's known breeding range has been Wakulla County, Florida.

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THE LAND MOLLUSCA OF COOSA COUNTY, ALABAMA

By Allan F. Archer

Coosa County, Alabama, lies in the east central portion of the state. It is of particular interest in possessing a characteristic Piedmont fauna, at least insofar as the lower section of the Pied-

mont is concerned. The data presented are the result of ecological and biological studies carried on under the auspices of the Department of Conservation of the State of Alabama. Some of the most significant collections were made during the expedition of June, 1940, under the auspices of the Department of Conservation and the Alabama Museum of Natural History. Several other important visits to the county have been made by me.

H. H. Smith made excellent collections of Mollusca in Chambers and Randolph Counties. The latter county resembles Coosa County in topography but is slightly less irregular in surface. Coosa County surpasses all Piedmont counties in Alabama in the variety of topography, and is therefore richest in suitable collecting spots. Not merely is the Piedmont represented over most of the county, but there is a minor representation of the Blue Ridge Province in the northwestern corner. There we find the Talladega Mountains. Their snail fauna is rather indifferent, although there are some special botanical features of interest. In the southwestern corner of the county are a few square miles of Coastal Plain country.

The Talladega Mountains present a more or less mature topography. Otherwise Coosa County is characterized by irregular uplands, almost mountainous in spots, ravines, valley slopes, and flat valleys. The ravines present a juvenile aspect, and at Hatchet Creek three obscure ravines have waterfalls. The soils of the county are reddish or gray sand-clay materials quite lacking in lime, but on the slopes at least fairly well mineralized. The poorest molluscan localities are found where mica schist outcrops. A considerable proportion of the county is underlain by mica schist (Ashland), granite (Pinckneyville), and quartzite. Basic and acidic intrusive rocks are present. Chlorite schist, slate, and dolomite occur in the northwestern corner. It is thus obvious that we are dealing with an ancient continental area having a predominance of crystalline and metamorphic rocks.

Woodland covers a considerable portion of the country, being least in evidence on cultivated uplands and flat valleys. Upland areas have as their forest cover oak-pine communities (shortleaf pine, blackjack oak). Pine and oak-pine cover also occur on slopes, especially on spurs of interfluves, but more species of

pines, oaks, and various hardwood species of lesser importance are present. Beech, black, white, and Spanish oak occur even in top ravines. Typical ravines of the Piedmont area are characterized by the following woody plants: *Pinus echinata, Quercus alba, Q. borealis maxima, Q. velutina, Hicoria alba, Fagus grandifolia, Magnolia macrophylla, Liriodendron tulipifera, Aralia spinosa, Cercis canadensis, Cornus florida, Hamamelis virginiana, Nyssa sylvatica.* The chestnut oak (*Q. montana*) also occurs in the Talladega Mountains. Species of the lower story include *Ilicium floridanum, Euonymus americanus, Hydrangea quercifolia, H. arborescens, Azalea nudiflora, Rhododendron punctatum, Kalmia latifolia, Halesia diptera.* By way of contrast between subtropical and montane floras there is present in one locality of the Talladega Mountains *Galax aphylla* in company with the palm, *Serenoa serrulata.*

Wherever there has been sufficient recovery from fires an adequate leaf litter, humus, and topsoil are formed. In the Talladega Mountains many acres of timber lack the layer of humus between the leaf litter and soil (due to recent fires). In the Piedmont area, with few exceptions, conditions are much better. The hydrogen ion concentration of the humus and topsoil ranges from about 5.0 to a little above 6.0. The lower pH values occur at the bottoms of ravine slopes close to water wherever growths of laurel, rhododendron, and azalea prevail. Lower values likewise may occur in impoverished soils of the uplands. The higher pH values appear on the middle and upper zones of stream-valley slopes and ravines (of the lower series). Even here the humus is predominantly mouldy except in patches actively worked-over by soil arthropods, or under concentrations of twigs, limbs, bark, and hardwood logs, as well as where stones and rocks are numerous. Some slopes are entirely rocky, although there is no real talus formation. In general the richest humus occurs in those zones where conditions of dryness or partial dryness prevail.

The lack of calcium carbonate is undoubtedly one factor in determining the rather acidic qualities of Piedmont soils. Another immediate factor is the acid break-down of oak leaves and pine straw. A. E. Boycott (The Habitats of Land Mollusca in Britain, Journ. Ecology, 1934, Vol. 22, pp. 11–12) states that

shelter and lime are complementary factors which interact with climate. He further states that damp acid woods may have quite a respectable fauna. This is in part true of the Piedmont, although in Alabama and Georgia the zones in acid woods which dry out during dry spells have a richer fauna than do the perpetually damp zones. Boycott also states that humus samples from acid woods are not as rich either in Mollusca or Arthropoda as are samples from calcareous woods. To a large extent this is true in Coosa County. A large series of humus samples fail to yield expected snails like *Punctum minutissimum*, but instead yield Retinellae and *Zonitoides arboreus*. However, erigonine and theridiid spiders are quite as abundant in humus samples from Hatchet Creek as from calcareous localities. Likewise false scorpions, Phalandidae (*Libitiodes sayi*), as well as beetles of the families Carabidae, Pselaphidae, and Histeridae are reasonably common in leaf litter as well as under wood.

Aside from the minutiae the larger mollusks are fairly common. In fact Coosa County comes next to ranking with the best of the Piedmont counties in Alabama and Georgia. However, H. H. Smith collected a phenomenal series of minutiae at Roanoke in Randolph County, actually a total of 35 authentic species excluding the slugs. For the entire county there are approximately 39 or 40 species known. The soil of the county must contain more lime than is to be found in Coosa County, although the rock formations are Archaean igneous gneiss and schist. Randolph exceeds all known Piedmont counties of Georgia. Coosa County, however, is hardly surpassed by any other Alabama counties in some Arthropoda (which certainly do not depend on lime). The ample nature of the spider fauna is illustrated by the fact that the family Argiopidae, already fully catalogued, comprises 36 species.

The list given below is briefly annotated:

1. *Philomycus carolinianus* (Bosc.). Five mi. so. of Rockford; Swamp Creek; Hatchet Creek; Hanover; Talladega Mountains.

2. *Deroceras laeve gracile* Rafinesque. Swamp Creek.

3. *Haplotrema concavum* (Say). Swamp Creek; Hatchet Creek. Rather common under ripe logs and in hollows under rocks.

4. *Anguispira alternata crassa* 'Clapp' Walker. Not common. Nearly as often in piles of rocks as under logs or bark.

5. *Discus patulus* (Deshayes). Hatchet Creek. Although occasionally under rocks it is locally abundant in association with logs and bark.

6. *Helicodiscus parallelus* (Say). Swamp Creek; Hatchet Creek. Under rocks or in leaf litter.

7. *Euconulus chersinus* (Say). Swamp Creek; Hatchet Creek; Talladega Mountains. In leaf litter.

8. *Retinella indentata paucilirata* (Morelet). Five mi. so. of Rockford; Swamp Creek; Hatchet Creek. This species bears a suspicious resemblance to *R. carolinensis*, but anatomical material collected in winter will be needed to prove its identity. Generally in leaf litter, under bark, or rocks.

9. *Retinella sculptilis* (Bland). Hatchet Creek. Smaller than the form in North Carolina.

10. *Mesomphix perlaevis* Pilsbry. Swamp Creek; Hatchet Creek. Generally buried in humus.

11. *Mesomphix pilsbryi* (Clapp). Five mi. so. of Rockford; Hanover; Talladega Mountains. Occasionally under logs.

12. *Hawaiia minuscula* (A. Binney). Rockford; Hatchet Creek.

13. *Striatura meridionalis* (Pilsbry and Ferriss). Hatchet Creek. In leaf litter.

14. *Gastrodonta interna* (Say). Five mi. so. of Rockford; Swamp Creek; Hatchet Creek; Hanover; Talladega Mountains. Common under loose bark on logs; also under rocks. One of the most abundant species; over 100 have been taken.

15. *Zonitoides demissus* (A. Binney). Swamp Creek; Hatchet Creek.

16. *Zonitoides intertextus* (A. Binney). Five mi. so. of Rockford; Swamp Creek; Hatchet Creek; Hanover; Talladega Mountains. On slopes and uplands.

17. *Zonitoides arboreus* (Say). Five mi. so. of Rockford; Swamp Creek; Hatchet Creek; Talladega Mountains.

18. *Polygyra pustuloides* (Bland). Hatchet Creek. Under rocks on rich, dry slopes.

19. *Stenotrema barbigerum* (Redfield). Swamp Creek;

Hatchet Creek; Talladega Mountains. Widely scattered under fallen bark, ripe logs, and in rock piles. Only 29 specimens have been taken.

20. *Stenotrema stenotrema* (Pfeiffer). Hatchet Creek; Talladega Mountains. On the under surfaces of rocks in rock piles; also under logs and bark. It occurs from the bases of ravines and slopes up to the summits. At Hatchet Creek it is the most abundant *Stenotrema*. Sixty-one specimens have been collected.

21. *Stenotrema maxillatum* (Gould). Swamp Creek; Hatchet Creek. This snail occurs on the middle and upper zones of the lower series of side ravines, often in rather open cover, very dry in late summer. It is generally found on the under surfaces of angular rocks, either scattered rocks or rock piles. At least 66 specimens have been collected in both localities.

22. *Mesodon inflectus* (Say). Five mi. so. of Rockford; Swamp Creek; Hatchet Creek; Hanover; Talladega Mountains. In rock piles and under ripe logs. At Hatchet Creek there is a very large race whose greater diameter exceeds 13 mm.

23. *Mesodon perigraptus* (Pilsbry). Five mi. so. of Rockford; Swamp Creek; Hatchet Creek; Hanover; Talladega Mountains.

24. *Mesodon thyroidus* (Say). Swamp Creek; Hatchet Creek; Talladega Mountains.

25. *Triodopsis tridentata* (Say). Hatchet Creek. Usually under rocks but also under ripe logs and fallen bark, both in hardwood and pine areas. The most common species of the genus. Thirty-one specimens have been collected.

26. *Triodopsis fallax vannostrandi* (Bland). Five mi. so. of Rockford; Swamp Creek. According to Pilsbry's new manual this species is to be known as *T. vannostrandi alabamensis* (Pilsbry). Under logs, rocks, and in plant debris. Not as common as *tridentata* but pretty generally distributed in some ravines and in open fields.

27. *Triodopsis caroliniensis* (Lea). Hatchet Creek. In rock piles. Uncommon.

28. *Triodopsis albolabris major* (A. Binney). Hatchet Creek.

29. *Gastrocopta pentodon* (Say). Hatchet Creek. Found mostly in arthropod dung at the bases of large rocks.

30. *Strobilops labyrinthica* (Say). Swamp Creek; Talladega Mountains. Under beach logs.

31. *Strobilops aenea* Pilsbry. Hatchet Creek. Under ripe logs on rocky ground. Careful search failed to find this species under loose bark on logs (its customary habitat) although plenty of *Discus, Gastrodonta*, and *Zonitoides arboreus* were present.

COLOR VARIATION IN *OLIVELLA BIPLICATA*

BY D. S. AND E. W. GIFFORD
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The following remarks are based upon a series of 2757 specimens of *Olivella biplicata* collected alive at Bolinas, Marin County, California, November 12 and December 12, 1940, and January 26, 1941. Of this series 94 are very young, the largest being only 12 mm. long, the smallest 7 mm. long.

Of the 2757, all but one (a xanthochroistic specimen) have varying amounts of bishop purple color (Maerz and Paul,[1] plate 44, H 10) about the aperture, especially near the base of the columella. Another division of the 2757 may be made on the basis of presence or absence of orange coloring within the aperture. 299 have varying amounts of orange, 2458 (including the 94 very young shells) lack it.

Normal external color in adults varies from pearl gray and moonbeam gray (Maerz and Paul, plate 44, A 1 and A 2) to grayish brown and brownish suffused with purple. The brownest individual matches more or less Maerz and Paul's blue fox color (plate 47, E 1). The darkest individual (not quite adult) matches approximately Maerz and Paul's plate 48, E 1 which is a grayish brown. The parietal callus is white or whitish in all. Many have a wash of "horn" color on the body whorl. This is true even of some of the albinos, which appear ivory in color (Maerz and Paul, plate 10, B 2). This "horn" color is ephemeral and disappears in beach-worn specimens.

All have bishop purple at base of columella and in the aperture except the xanthochroistic one mentioned. All normally colored

[1] A. Maerz and M. Rea Paul, A Dictionary of Color. First Edition. McGraw-Hill Book Co., Inc., New York. 1930.

shells have purple on the inner edge of the lip, and traces of old lips are indicated by purple or maroon vertical lines of growth on the exterior surface of the body whorl. In the albinos the quantity of purple is reduced but never absent. Some of the albinos have the purple lip edge limited to the lower (anterior) end of the lip and the canal.

As already mentioned, in 299 specimens the aperture displays varying amounts and shades of orange or yellow. This is never on the lip, which is usually purple-edged, but always within the aperture, sometimes at about the limit of visibility. It occurs on the columellar side of the aperture, in the canal, and on the inner surface of the body whorl. A very few have it slightly on the parietal callus. Of the 299 specimens with orange, 37 (12.4 per cent) are albinos. Some have the orange coloring denoted by Maerz and Paul as "orange-peel" (plate 10, L 10). Others have only a bare trace of orange or yellow and appear to correspond to *Olivella biplicata lapillus* described[2] as having the "interior of the aperture cream-colored."

It would seem that the unique xanthochroistic specimen, which is orange both inside and outside, is a recessive in which both purple and gray completely disappeared, leaving only orange, whereas in the albinos only gray disappears, the purple always remaining in some measure. From this point of view the orange specimen is perhaps comparable to red-haired human beings in whom lipochrome has replaced the dominant melanin. The orange specimen is really an orange-yellow, matching Maerz and Paul color plate 10, C 5. The base of the columella and the folds are pure white, as is the fasciole region and the parietal callus. The second whorl is white, but the body whorl is orange. The transition from orange to white is gradual. The suture edge is orange throughout. In the aperture the inner surface of the body whorl is deeper orange than the exterior.

Of the 2458 specimens without trace of orange within the aperture, one is orange externally and not wholly, as the lip portion of the body-whorl is pearl gray. This specimen has purple within the aperture, both on the columellar side and on the inner surface of the body-whorl, where it is wild iris color (Maerz and Paul,

[2] E. G. Vanatta, Notes on Oliva, THE NAUTILUS, vol. 29, p. 71, 1915.

plate 44, B 5). It is obviously not in the same category as the preceding xanthochroistic specimen. It is, however, notable. The occurrence of orange externally is thus seen to be limited to two specimens in the series of 2757. The animals inhabiting these two shells did not differ in appearance from the others.

Of the 2458 specimens without trace of orange within the aperture, 177 (7.2 per cent) are albinos (this includes 9 very young ones), and 2280 are in the range of normal color. The animals inhabiting albino shells look like those in normally colored shells. It should be noted that albinism is more frequent in the shells with orange within the aperture than in shells without orange. The respective frequencies were 12.4 per cent and 7.2 per cent.

The ventral side of the spire of most of the adults is pitted and gray because of the ravages of a parasite, a sponge identified by Professor B. L. Clark as a species of Cliona. There is no trace of this parasite in the young shells.

The youngest of the normally colored shells are normal in color on dorsal side, but streaked vertically with wavy brown (Maerz and Paul, plate 7, A 12) lines on the ventral face of the main whorl, suggesting the description of a similar character in *Olivella pycna*,[3] for which Bolinas is the type locality. In young albinos this appears merely as a slight brown suffusion. This juvenile characteristic disappears as the shell grows older. Also in these very young specimens the white parietal callus appears prominently.

Some of the young shells have a whitish band below the suture separating the body whorl from the second whorl. In some near adults this banded character is still retained, but assumes a buffish color. In the full adult it disappears.

In regard to Mendelian inheritance of color characters, Professor R. E. Clausen was kind enough to look over our counts, but informed us that, although Mendelian laws might be operative, it would be difficult to establish their presence except by controlled breeding.

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[3] S. Stillman Berry, An Undescribed Californian Olivella, Proc. Malacological Society of London, vol. 21, p. 262, 1935.

UTILIZATION OF STONES FOR SHELTER BY LAND SNAILS

By WILLIAM MARCUS INGRAM

This paper is introduced after reading Baker (1898), W. G. Binney and Bland (1869), W. G. Binney (1885), and A. Binney (1851) who generally state that land mollusks may be collected under stones. Simpson (1901) states that individuals of *Triodopsis albolabris* (Say) are frequently found under stones. With this in mind 1350 stones were overturned on the Edmund Niles Huyck Preserve, Rensselaerville, Albany County, New York, between June 15 and September 1, 1940, in an attempt to determine the snail fauna that one might expect to find beneath them.

Stones in the following areas of the preserve were rolled over: beech-maple, beech-hemlock, and maple woods; flood-plain forest; hedge rows; abandoned grass and berry covered fields and apple orchards; and bogs. Only 3 of approximately 5,000 snails which were observed on the preserve were taken from beneath stones; these were 3 *Anguispira alternata* (Say), collected beneath 2 stones bordering a maple hedge row. In beech-maple, beech-hemlock, and maple areas where decaying logs and humus were found over moist soil, the snails limited themselves to these habitats rather than seeking shelter beneath stones. In hemlock and in flood-plain forest areas logs were preferred in the former and water-carried debris piles, consisting of accumulated sticks, soil, dead grass, and humus, in the latter. In hedgerows of beech, maple, or oak the fallen leaf cover was the typical snail abode. In grass and berry-covered fields and abandoned apple orchards where stones were present grass roots and berry roots were snail havens. In bogs, yellow birch logs and frond-strewn hummocks covered by bog ferns provided snail shelter. The following were the land snails which were found on the Huyck preserve:

Polygyridae

Triodopsis albolabris (Say)
T. tridentata (Say)
T. notata (Deshayes)
T. dentifera (Binney)
Stenotrema fraternum (Say)

Zonitidae

Mesomphix cupreus (Rafinesque)
M. inornatus (Say)
Euconulus fulvus (Müller)
Zonitoides arboreus (Say)
Ventridens intertexus (Binney)

Endodontidae

Anguispira alternata (Say)
Discus cronkhitei catskillensis (Pilsbry)
Helicodiscus parallelus (Say)

Haplotrematidae

Haplotrema concavum (Say)

Cochlicopidae

Cochlicopa lubrica (Müller)

Succineidae

Succinea ovalis Say
S. retusa Lea

During the late fall of 1940 at Ithaca, New York, the ground beneath stones was examined for snails in Six Mile Creek. Here a small flood-plain of approximately three acres is stone-strewn; the forest is sparsely scattered sycamore. In the area examined logs were entirely absent and water-carried debris piles were lacking. Due to the rocky character of the plain the sycamore leaf humus does not become packed, but is uptilted by the numerous stones thus allowing the soil beneath to become very dry in the fall. Here 265 snails were collected from beneath 956 stones; only one individual, *Triodopsis albolabris*, was taken from beneath sycamore leaf humus. The flood-plain species were:

Polygyridae

Stenotrema hirsutum (Say)
Triodopsis albolabris (Say)
T. tridentata (Say)
Mesodon thyroidus (Say)

Haplotrematidae

Haplotrema concavum (Say)

Zonitidae

Mesomphix cupreus (Rafinesque)
Ventridens intertextus (Binney)

Endodontidae

Anguispira alternata (Say) *Helicodiscus parallelus* (Say)

Succineidae

Succinea ovalis Say *S. retusa* Lea

These data are indicative in the areas studied that snails prefer shelter beneath humus and logs (where moist soil exists), to shelter beneath stones where the three are found together on the forest floor. When logs and debris piles are not available snails seek shelter beneath stones rather than remain on top of the substratum beneath humus where the soil is dry.

To further observe the selection of shelter by land snails between the stone and log-humus habitat, several species were removed from the Six Mile Creek area and were carried into a beech woods. Here stones, logs, and humus were abundantly distributed over a moist forest floor. Twenty individuals representing *T. albolabris*, *T. tridentata*, *H. concavum*, and *M. cupreus* were removed to a staked-off area in the beech woods. In 24 hours all twenty were established beneath the log-humus habitat. Further examination of the area 30 days later showed that none had sought shelter beneath the available stones, but of 14 individuals that the writer was able to locate all were in the log-humus habitat.

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A NEW RACE OF *PARAPHOLYX EFFUSA*

By Frank C. Baker

Parapholyx effusa klamathensis nov. var. Fig. 1.

Shell differing from typical *effusa* in being twice as large, much thinner, the body whorl more voluminous; the aperture is larger, higher than wide and in adult specimens more effuse; the lower part of the aperture is more angular; the columella is thinner and less indented and the inner lip is narrowly reflected over the columellar region, but not as tightly as in *effusa*; there is sometimes a small umbilical chink; in immature shells the aperture is much higher than wide. Color greenish horn to light brown;

1 2 3

Fig. 1. *Parapholyx effusa klamathensis*. Figs. 2, 3, *Hypsobia tanyi*.

sculpture of fine growth lines crossed by fine spiral lines. Edge of lip thin and sharp.

H. 11.3; M. diam. 14.0; L. diam. 9.3; Aperture H. 9.4; D 8.5 mm. Holotype

H. 10.5; M. diam. 13.3; L. diam. 9.2; Aperture H. 9.0; D 8.5 mm. Paratype

H. 9.5; M. diam. 13.0; L. diam. 9.0; Aperture H. 8.2; D 8.0 mm. Paratype

Type locality: East side Upper Klamath Lake, 13 miles north of Klamath Falls, Klamath Co., Oregon. Collected by H. B. Baker. Types in U.S.N.M., No. 406024.

Some 50 specimens of this large form of *effusa* have been examined and it appears racially distinct from the smaller type form found in California. It is related to *Parapholyx mailliardi* Hanna from Eagle Lake, Cal., differing in being larger and thinner with a narrower columella less deeply indented. The aperture is rounder and is not sharply angular below, as in *mail-*

liardi. The form of the columellar lip in *mailliardi* allies it with *solida* Dall rather than with *effusa*. *P. e. klamathensis* is an abundant mollusk in Upper Klamath Lake. A specimen from the outlet of Upper Klamath Lake, collected by J. Henderson, measures 12 mm. in height and 15.5 mm. in diameter. The types of *effusa* came from the Sacramento River, Cal. (Lea collection 121167, U.S.N.M.) and a specimen measures, H. 6.1; Gr. diam. 8.0; L. diam. 6.0; Aperture H. 4.5; D. 4.5 mm.

A NEW SPECIES OF FRESH WATER MOLLUSK FROM CHINA

By SUI-FONG CHEN

In a collection of Chinese fresh water mollusks received by the United States National Museum from C. C. Tang, there is one undescribed species which is now described and named. I am taking the pleasure to name this species after the collector, C. C. Tang, who has done a great deal of work concerning the problem of molluscan intermediate hosts in China.

I wish here to express my appreciation to the authorities of the United States National Museum and to Dr. Paul Bartsch, the Curator of Mollusks and Cenozoic Invertebrates, for the privilege of studying their Chinese collection.

Hypsobia tangi, new species. Fig. 2.

Shell very small, fragile, elongate-turreted, pale yellow throughout, covered with a thin layer of periostracum. Nuclear whorls eroded, with 4 whorls remaining. Postnuclear whorls inflated, well rounded, and marked with microscopic incremental lines. Spiral sculpture absent. Suture well impressed. Periphery moderately rounded. Umbilicus strongly perforated. Aperture elliptical, pyriform and strongly flared; base long, slightly rounded, but rather flattened; outer lip simple, well expanded, thickened within; inner lip simple, thickened, slightly arched almost parallel to the parietal wall, separated from it by a narrow suture. Columella simple. Operculum thin with a subcentral nucleus. The radula has the formula $\frac{3\text{–}1\text{–}3}{2\text{–}2}$: 3–1–4 : 15 : 10. Fig. 3.

The type, United States National Museum Catalogue number 516433, was collected by C. C. Tang at Ying-an, central Fukien

Province, China, and gives the following measurements: length 2.4 mm.; diameter 1.2 mm.; length of aperture 1.0 mm.

This species resembles *Hypsobia humida* Heude, but it is much smaller and the body whorl comparatively is also smaller.

LYMNAEA AURICULARIA LINNAEUS IN WESTERN WASHINGTON AND KAMCHATKA

BY W. J. EYERDAM

Recently Professor Trevor Kincaid told me that he had found a decidedly unfamiliar species of *Lymnaea* in a small lake north of Seattle. From his description it was easy to guess that the species must be *Lymnaea auricularia* Linne. When I received three specimens I was able to verify my guess definitely.

In my own collection I have specimens that I took from a small artificial pond north of Seattle in 1933 and another small lot from Green Lake, north Seattle, in 1934. At that time the shore of the lake was littered with windrows of dead shells of *Lymnaea palustris* Müll., *Physa virginea gabbii* Tryon, *Planorbis trivolvis hornii* Tryon, and *Anodonta kennerlyi* Lea. Only two broken shells of *Lymnaea auricularia* L. were found amongst the thousands of *Lymnaea palustris*.

Only a casual mention of this species is made in Hendersons' "The non-marine mollusca of Oregon and Washington" 1929. This is on page 132. Henderson merely states. "The range and synonymy given by Hannibal are wholly untenable."

The specimens taken from Green Lake and the small lake north of Seattle by Kincaid compare rather closely with specimens that I collected in a pond on the shore of the river Tom near Tomsk, Siberia, in 1928. Specimens that I collected in a small artificial pond north of Seattle compare quite closely with topotypes of *Lymnaea stagnalis occidentalis* Hemphill collected by Junius Henderson in 1928 in Lake Whatcom near Bellingham, except that the spire is somewhat shorter and the color is a darker greenish horn color, also that the Lake Whatcom shells are more or less malleated. The character of malleation is not very consistent with our Puget Sound region fresh water shells as it occurs frequently amongst individual overgrown *Lymnaea* and *Physa* in some of our numerous quaternary lakes, especially those with

deep muddy bottom and shores. A few shells from the small artificial pond north of Green Lake also compare closely with specimens that I collected in Yorkshire, England in 1928 and at Stockholm, Sweden, in 1930. Several of the ¾-grown specimens are similar to two specimens that I collected in a pond near the mouth of the Kamchatka river at Ustj, Kamtchatsk, in 1925. The Kamchatka specimens are also dead ringers for some of the topotypic specimens from Lake Whatcom and also differ but slightly from specimens of *Lymnaea pereger* Müll. which I have from Surrey, England. The most typical altho rather undersized specimens of *Lymnaea auricularia* that I have are from the Bystrytza river in Poland. My specimens from near the mouth of the Kamchatka river have been submitted to three American specialists of mollusks and they each gave them a different name, thus proving that none of them had had much to do with East Siberian shells. Vanatta called them *Lymnaea vahlii* Möller which is a Greenland species, Bartsch called them *Lymnaea ovata* Linne, which comes pretty close to being correct, while Bryant Walker following Westerlund who was one of the best authorities on northern Asian freshwater shells, called them *Lymnaea ovata* Drap. var. *aberrans* West. which is probably correct when judged by hair-splitting differences.

Without comparisons of anatomical material and judging only from shell characters it seems that there must be imperceptible gradations of characters that link *Lymnaea stagnalis, Lymnaea ovata, Lymnaea pereger,* and *Lymnaea auricularia* with each other. Vast areas in northern Asia have never been explored for shells and northern Canada and Alaska are still practically untouched, although Dr. Alan Mozley has done a great deal in those regions in collecting freshwater shells.

I conclude that the introductions by accident of *Lymnaea auricularia* with aquarium specimens to western Washington have come from various countries in Europe, especially from England and Germany. *Lymnaea auricularia* intergrades closely into several races of *Lymnaea stagnalis* and besides being common to northern and central Europe is scattered sparingly throughout the river systems of northern Asia and the quaternary regions of North America.

WHAT IS *ANODONTA (EUPHRATA) BAHLIKIANA* PALLARY?

BY DR. F. HAAS

In 1933 Pallary (Bull. Mus. Hist. Nat. Paris (2), 5, p. 150) proposed a new section of *Anodonta, Euphrata,* for an assumedly new species from Nahr Bâhlik, a left tributary of the Euphrates in Syria. When in 1940 I published my tentative classification of Palearctic Unionids (Zool. Ser. Field Mus., 24, p. 115–141; 1940), no more detailed description of this new *Anodonta* from Syria had come to my knowledge and so, familiar with Pallary's tendency toward splitting up old and known species, I tentatively added his "species" of *Anodonta* to the synonomy of *Anodonta cygnea* Linne. Very shortly after the above-mentioned classification had been published, Pallary's "Deuxième Addition à la Faune Malacologique de la Syrie" (Mém. Inst. Egypt., 39, p. 1–141, pls. 1–7, 1939) was received and an adequate description and figure of *Anodonta* (*Euphrata*) *bahlikiana* was found in it; and this additional information made it obvious that the species in question can by no means be separated from *Anodonta vescoiana* Bourguignat, 1857. If I had been mistaken in combining *bahlikiana* with *cygnea,* I had been right in so far as *bahlikiana* was no new species, and owed its creation only to too fine a discrimination.

The exact systematical position of *Anodonta* (*Euphrata*) *bahlikiana* now being suggested, a word or two may be said about the section *Euphrata* created for *Anodonta bahlikiana.* As I have tried to point out in 1940, *Anodonta vescoiana,* now including *A. bahlikiana,* does not belong to the Palearctic group of *A. cygnea,* but to the same group as *A. woodiana* Lea, widely spread in East Asia and even represented in the North American fauna by the species grouping themselves around *A. grandis* Say. To my judgment, this group belongs to typical *Anodonta,* and cannot be separated into a special subgenus or section. This has been tried by P. Fischer, who (Man. Conch., 1886, p. 1003) proposed the subgeneric name of *Pteranodon* for *Anodonta magnifica* Lea, now considered a synonym of *Anodonta woodiana* Lea. Logically, *Euphrata* Pallary thus becomes a synonym of *Pteranodon* Fischer.

Quite recently, Shadin (Faune de l'URSS., Mollusques, 4, No. 1, Unionidae, p. 117, 140; 1938) has tried to reinforce the separation of the *woodiana* group as a distinct subgenus, *Pteranodon*, from *Anodonta* proper; but the distinctive features offered, *i.e.*, shape of the shell and of the glochidium, do not seem convincing to me.

NOTES ON *ANGUISPIRA* AND *DISCUS*

By GORDON K. MacMILLAN
Carnegie Museum

This paper is a supplement to "A Monographic Study of the Snails of the Genera *Anguispira* and *Discus* of North America, exclusive of Mexico," which appeared under my authorship in the Annals of the Carnegie Museum, vol. 27, 1940, pp. 371–426.

Discus patulus carinatus, which new varietal name I gave to *Discus patulus angulatus*, stands as a good subspecies, as *Helix (Patula) perspectiva carinata* Gratacap (Bull. Am. Mus. Nat. Hist., vol. 14, 1901, p. 358) is a synonym of *Discus bryanti nigromontanus* (Pils.). I had the opportunity this past spring of examining Gratacap's *carinata* at the American Museum of Natural History. This variety had previously been placed under *Discus patulus angulatus* Kutchka as a questionable synonym.

The distributional range of *Discus patulus carinatus* can be extended westward to Grand Rapids, Michigan, and Whitehall, Greene County, Illinois. This subspecies has also been recorded from Brighton and Oberlin, Ohio, and New Harmony, Indiana.

In the Monographic Study of *Anguispira* and *Discus* I included three charts showing the interrelationship of the various species. One of these charts showed *Discus rotundatus* (Mueller), *D. mcclintocki* (F. C. Baker), and *D. m. angulatus* (F.C.B.) descending from *D. patulus*. Since B. Shimek found a living specimen of *D. mcclintocki* in Iowa in 1928 there is the possibility that this species is not ancestral to *D. patulus*, which opinion J. P. E. Morrison holds. From this it is more plausible that *D. mcclintocki* and *D. m. angulatus* are the ancestral or parental species of *patulus*, or all, together with *D. rotundatus*, are offshoots of the same common ancestor that existed in the past geological ages. Further study of *Discus sandersoni* (Russell), *D. similimus*

(Stearns), and *D. ralstonensis* (Cockerell), specimens of the Cenozoic and Mesozoic Eras, may prove that one of these is the ancestor of all the species and subspecies of *Discus* in North America.

To the list of species of *Discus* should be added *Discus randolphi* described as *Zonitoides randolphi* by H. A. Pilsbry in the NAUTILUS, vol. 12, 1899, p. 87.

In an article entitled "The Catalogue of the Binney and Bland Collection of the Terrestrial Air-breathing Mollusks of the United States and Territories in the American Museum of Natural History, with enumerations of Types and Figured specimens; and supplementary notes" (Bull. Am. Mus. Nat. Hist., vol. 14, 1901), L. P. Gratacap, on page 357 under *Helix* (*Patula*) *alternata* Say, makes the following comment, "Variation in the intensity and distribution of the color marks, partial suppression and very coarse prominence of the striae, the latter in its extreme form in var. *costigera* Bld., and flattening of the whorls are the unstable features of this shell, etc." The variety called *costigera* by T. Bland is a synonym of *Anguispira alternata paucicostata* Kutchka, which had previously been placed as a synonym of *A. alternata costata* (Lewis), and which Gratacap thought was synonymous with *A. a. costata*. *A. a. paucicostata* has been found in Monroe County, Tennessee, by Mrs. G. Andrews and a specimen from the Crooke Collection at the American Museum of Natural History is labeled "Smoky Mountains."

The distributional range of *Anguispira alternata crassa* Clapp can be extended to include localities in Oklahoma and Missouri. This subspecies had been separated from *alternata* as a variety by previous workers on North American land snails. The Binney and Bland Collection contains a specimen of *A. alternata* labeled "*Helix alternata* var. *lacrigatus* of my notes 4. Is it *infecta* Parr.?," and another labeled "*alternata* var. 4; not *infecta*," evidently received from L. Pfeiffer. In the same collection are five specimens labeled *Helix alternata australis* from Tennessee, from Elliot.

To *Anguispira alternata smithi* Walker should be added Stevenson, Jackson County, Alabama, as a new locality record. This subspecies has been found near Huntsville in the same county.

A specimen of *A. alternata carinata* (Pilsbry & Rhoads) found at Pelham, Westchester County, New York, extends the distributional range of this shell eastward from Pennsylvania through New Jersey to New York; and there is the possibility that this subspecies might be collected also in Delaware.

While the Monographic Study of *Anguispira* and *Discus* was in press a new variety of *Anguispira kochi* had been described as *eyerdami* by W. J. Clench and Gilbert Banks (Mem. Soc. Cubana Hist. Nat., vol. 13, 1939, p. 285, pl. 36, fig. 3). As I did not receive the reprint of this article until after my paper had come from the press, it was impossible for me to include it in that paper. However, from the description and figures of *Anguispira kochi eyerdami* and the remarks concerning it, I cannot refrain from considering it as a synonym of *A. kochi*. Even if it is considered a smaller, darker colored, and more depressed form of *A. kochi occidentalis* (Martens), it is still a synonym of *A. kochi*, as I have considered the former only a narrower and taller form of *A. kochi*.

For distributional records the following localities for *Anguispira alternata eriensis* (Clapp) are given:

ILLINOIS: Utica, LaSalle County. KANSAS: Kaw River Island, Lawrence, Douglas County. MAINE: Orono, Penobscot County; Cliff Island, Casco Bay, Cumberland County; Rum Key, Frenchman's Bay, Hancock County; Bald Porcupine Island, Frenchman's Bay, Hancock County. MASSACHUSETTS: House Island, Essex County; Manchester, Essex County; Eagle Island, Marblehead, Essex County. MICHIGAN: Bay Point, Monroe County; Macinaw, Cheboygan County; Cedarville, Sault Ste. Marie, Mackinac County; Cascade Glen, Ann Arbor, Washtenaw County. NEW YORK: Buffalo, Erie County; Ossian, Livingston County; Bluff Island, St. Lawrence River, Jefferson County. OHIO: Sandusky, Erie County; Kelleys Island, Lake Erie, Erie County; Perrysburg Township, Wood County; Shore of Maumee Bay, Lucas County; Green Island, Sugar Island, Starve Island, North Bass Island, South Bass Island, Gibraltar Island, West Sister Island, Put-in-Bay Island, and Rattlesnake Island, Lake Erie, Ottawa County. PENNSYLVANIA: North Girard, Erie County. WISCONSIN: Shore of Lake Koshkong, Dane County.

ONTARIO: Hamilton, Wentworth County; Hen Island, Pelee Island, East Sister Island, Middle Sister Island and North Harbor Island, Lake Erie, Essex County. QUEBEC: Cap Rouge.

PUERTO RICAN OLEACININAE

BY H. BURRINGTON BAKER

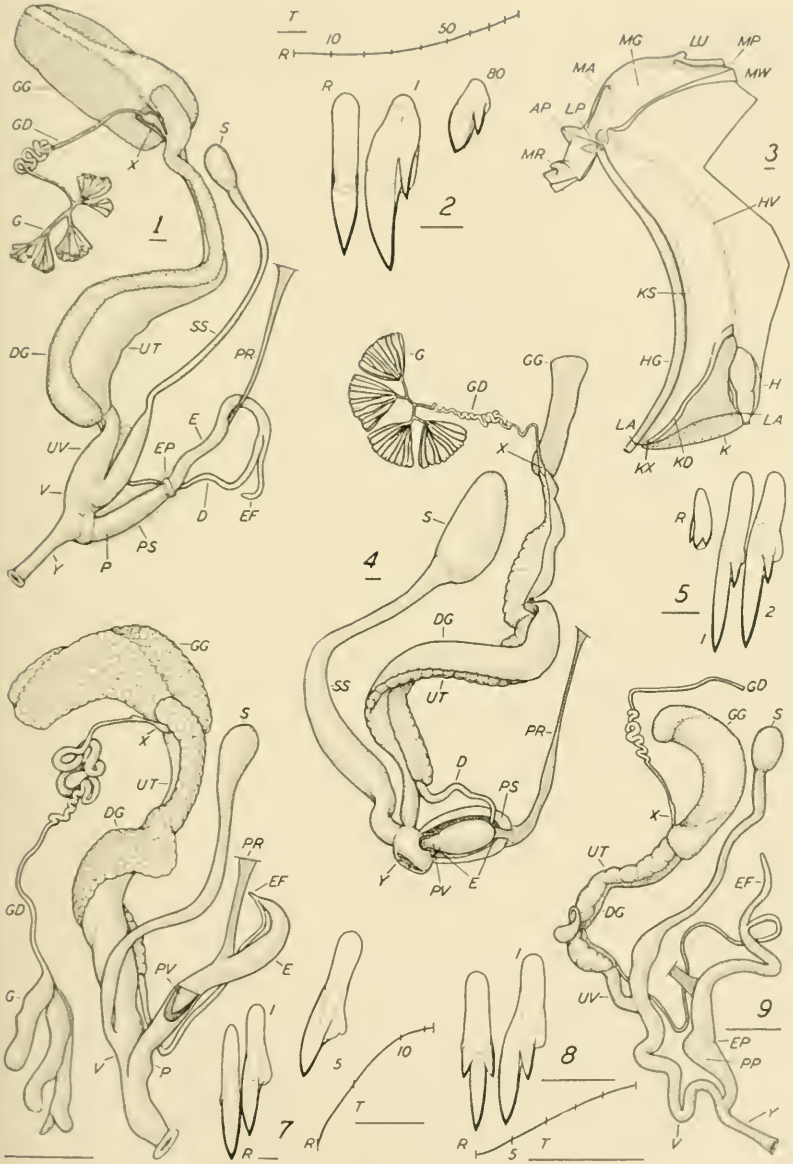
In 1935 (NAUT. 49: 21–22) a key to the Jamaican subgenera and sections of *Varicella* has briefly outlined their salient characteristics. In the present survey of the Oleacininae of Puerto Rico (West Indies), which, although poor in specific diversity (7 species), exhibit more fundamental divergences than do the numerous Jamaican forms, the anatomy of some of the members of the other groups is figured for comparison.

In plates 1 and 2, each scale for radular teeth indicates a length of 0.01 mm., for the right half of a transverse row (T) 0.1 mm., and for genitalia and pallial complexes 1 mm. Those abbreviated labels, which are not explained in the text, are defined in Bull. Bishop Mus. 166: 337 (1941).

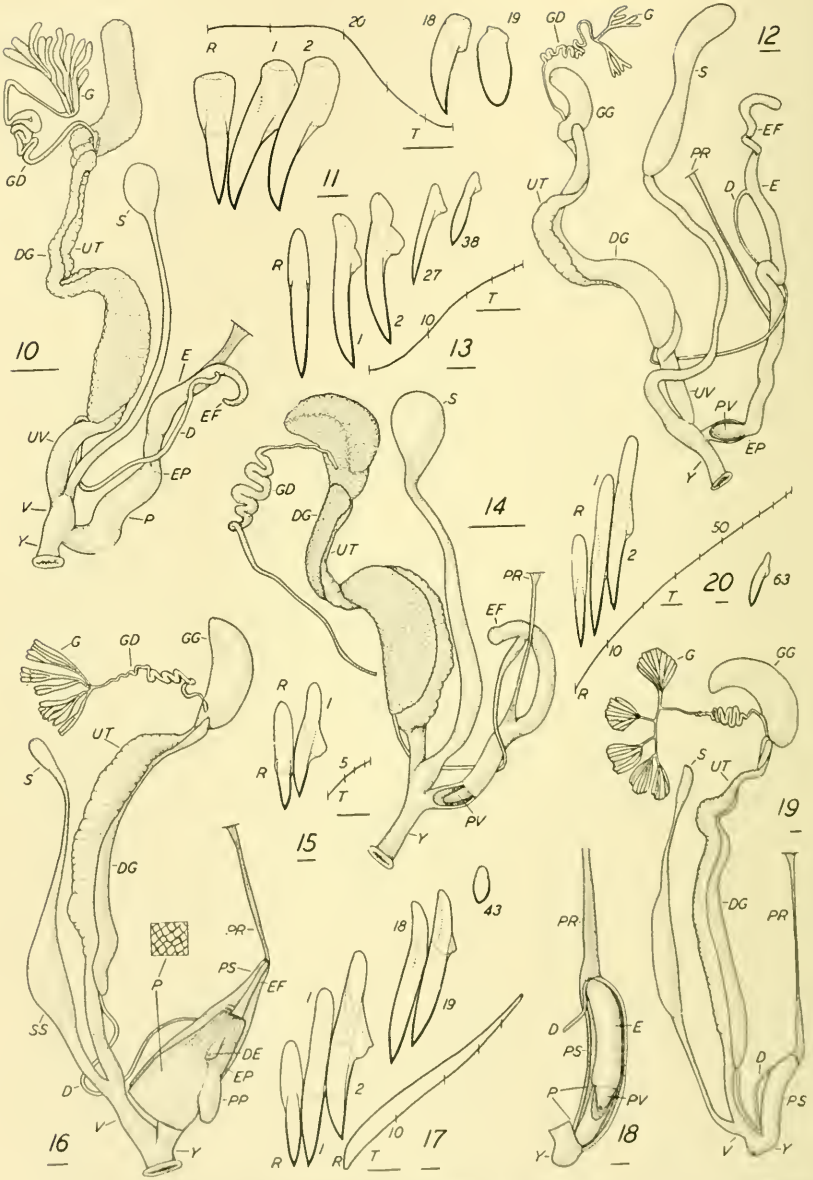
In the following anatomical definition of *Varicella*, comparisons are made with that of *Salasiella* (NAUT. 54: 80) and only salient differences will be noted. The anatomy of one species in each genus or subgenus is similarly compared to that of *V. leucozonias striatella*.

Foot elongate, with strong radiating sulci; head with middorsal cord marked off by 2 sulci; tail usually with weak middorsal sulcus broken posteriad; sole abruptly pointed or rounded. Mantle collar deep on palatal side, with small pneumostome (LP, f. 3) and broad glandular zone (MG) with anal lobe. Right mantle-lappet (MR) distant from parietal angle (AP); left ones broad, with anterior (MA) far from posterior (MP), which begins near small basal lobe (LU) and runs up columellar side. Lung wall with minor venation present but indistinct (not shown). Kidney (K), ureter (KD) and groove (KS) along hindgut (HG) similar.

Ovotestis (G, f. 1) with fan-shaped groups of alveoli in larger species. Vagina (V) usually very short; spermatheca (S) with stouter stalk (SS). Spermatophore of *V. mandevillensis* slender, fusiform and smooth; with horny wall. Prostate (DG) long, attached to uterus (UT) full length. Epiphallus (E) without free sheath, continuous (EP) with penis; well developed, with flagellum (EF) and receiving retractor (PR). Penis (P) without diverticulum; often with thin, partially free or intimate sheath (PS; outline only); with large cerebral nerve to base but with another pedal one to epiphallus. Atrium (Y) various.



Figs. 1–3, *Varicella leucozonias striatella*. Fig. 4, *Lacvaricella olabra*. Fig. 5, *V. procera*. Figs. 6–7, *Sigmataxis lacvinsculus*. Figs. 8–9, *V. acuticostata horrida*.



Figs. 10–11, *Variella vicina portlandensis*. Figs. 12–13, *V. portoricensis*. Figs. 14–15, *V. salcalosa*. Figs. 16–17, *Lacvariella interrupta*. Figs. 18–20, *L. playa*.

Labial lobes short but evident; buccal bulb ellipsoid; salivary gland ring fusiform. Oesophagus (without crop) entering near middle of buccal bulb. Radular teeth with subaculeate to aculeate mesocone markedly dominant; inner 3 or 4 centrifugals often slightly increasing in size; ribbon 1/15 to 1/5 length of shell (bigger than in most Spiraxinae), with 46–164 (mainly 60+), mesally almost transverse to V-shaped rows of 29–181 teeth each. Nerve ring more concentrated.

The Cuban group *Glandinella* (tentatively classed as section of *Melaniella*) and the Haitian groups *Varicellidea* and *Varicellopsis* (large shells with spiral sculpture) are omitted from the following key to the anatomically known subgenera of *Varicella, Sigmataxis* and *Laevaricella.*

1. Genus *Varicella* Pfr.: radula (not over 1/8 shell length) with over 46 (mainly 60+) fairly transverse rows of small teeth, tricuspid central and at least bicuspid centrifugals; vagina not very short; penis, internally plicate, demarcated by constriction from long naked epiphallus, which receives retractor below vas and has flagellum; spermatheca most sacculate above aorta; shell slender with widely spaced riblets; varices distinct, with growth sculpture between them; columella weakly truncate; type *V. acuticostata;* Fla., Cuba & (?) Haiti: ..... subgenus *Melaniella* Pfr.
2. Like 1, but central with ectocones vestigial or absent; vagina very short; animal usually with dark radial bands; shell shape various but columella usually more truncate; type *V. leucozonias;* Jamaica & Haiti: subgenus *Varicella* s.s.
3. Like 2 but radula (1/6 shell) with all teeth unicuspid and outer spatulate ones in rows curving caudad; penial retractor opposite vas entrance; shell varices not distinctly colored; type *V. curvilabris;* Jamaica: subgenus *Varicellina* Pils.
4. Like 3 but radula (1/5 shell) with all teeth aculeate in V-shaped rows; epiphallus opening through verge into thin-walled and usually small penis; penial retractor and shell varices more like 1; type *V. portoricensis* (Pfr.); Puerto Rico & Haiti: ..... *Vagavarix,* new subgenus.
5. Like 4 but flagellum much reduced; radula (1/7 shell) with fewer (30) rows of larger teeth; animal usually pale; columella spirally ascending (not truncate) and varices often vague; type *S. laeviusculus;* Jamaica: genus *Sigmataxis* Pils.
6. Like 4 but penis & epiphallus invested by heavy sheath, which apically receives retractor; plicate epiphallic cham-

ber demarcated from penial only by change to papillate lining and base of large stimulator; spermatheca very saeculate below aorta; shell smoothish between distinct varices, with pupiform apex; type *L. semitarum;* Lesser Antilles to Haiti: ..... genus & subgenus *Laevaricella* Pils.

7. Like 6 but epiphallus receiving vas apically and opening through verge into small penis (without stimulator); radula 1/4 shell length; atrial opening distant from tentacles; shell with obtusely conic apex; type *L. glabra* (Pfr.); Puerto Rico: ..... *Boriquena,* new subgenus.

VARICELLA (MELANIELLA) ACUTICOSTATA HORRIDA Pilsbry, pl. 1, figs. 8–9. Man. Conch. 19: 54.

The dissected animals were collected by Miguel L. Jaume at Mogote de Fonte, San Andreas, Consolación del Norte, Pinar del Rio, Cuba (ANSP. 163913). *Melaniella* is the least distinct of the 4 subgenera of *Varicella.*

Foot fuscous laterally; mantle collar pale. Lung pale, 2.7 base or kidney (little over base or 1.5 pericardium). Ovotestis (omitted from f. 9) with 5 alveoli. Penis internally with 5 pilasters, of which largest expands apically into obcordate papilla (outlined at PP). Radula (f. 8) with 79 broadly V-shaped (T) rows of 51 teeth; almost all centrifugals bicuspid; 1 mm. long. [In *V. gracillima floridana* Pils. from Stock Island, animal pale with dark tentacles; vagina much shorter and stouter, but as long as free oviduct.]

V. (S.S.) LEUCOZONIAS STRIATELLA Pilsbry, pl. 1, figs. 1–3. Man. Conch. 19: 95.

The figured animals were collected in the John Crow Mts. (EEJ), Jamaica (ANSP. 168242). Other species studied are, in the section *Costavarix, V. mandevillensis,* with 37 radular teeth in each of 61 rows, and *V. adamsiana,* with 55 in 69; in *Varicellula, V. blandiana,* with 45 teeth (75 rows); in *Varicellaria, V. procera,* with 95 teeth (f. 5) in 80 rows (central with 1–3 very variable cusps); and, in *Euvaricella, V. similaris,* with 91 teeth, *V. biplicatula dissimilis* with 101 (77 rows), *V. venusta* with 113 (73), *V. nemorensis* with 74 (69), *V. spina* with 29, and *V. levis* with 33 (58).

Foot (alive) blue-black with lighter sulci; long but stout; tentacles reddish orange; labial lobes short triangular. Surface of mantle collar (f. 3) and lappets dark, with light border. Lung

dark with jet blotches. Carrefour (X, f. 1) imbedded. Epiphallus internally with irregularly rhomboid folds; externally demarcated from penis by sphincter. [Flagellum slightly smaller in *V. procera*, subequal in *V. mandevillensis*, bigger in *V. similaris*, about length of rest of epiphallus in *V. spina* and longest in *V. blandiana;* all with retractor nearer epiphallic base and right eye muscle in atrial angle.] Penis internally with 5 beaded pilasters. Right eye muscle free from genitalia. Radula (f. 2) with 181 teeth in 149 rows (T); all centrifugals bicuspid; 4.5 mm. long.

V. (Varicellina) vicina portlandensis H.B.B., pl. 2, figs. 10–11. Naut. 49: 23 (1935).

The figured animals are from the type lot (ANSP. 162992), collected near Nonesuch (EJ3a), Jamaica. Since ectocones are present on all the centrifugals in the preceding subgenera and on none in this species, the gap between *Varicella* s.s. and *Varicellina* seems the greatest inside the genus.

Foot slender and moderately dark. Mantle collar pale. Lung diffusely pigmented; almost 5 times base or 4 kidney (1.4 base or pericardium). Vagina (f. 10) swollen and thick walled. Radula (f. 11) with 83 rows (T) of 93 unicuspid teeth, which are aculeate and in transverse series out to 18th, but then assume spatulate cusps and curve obliquely caudad; 2.3 mm. long.

V. (Vagavarix) portoricensis (Pfeiffer), pl. 2, figs. 12–13. Man. Conch. 19: 122.

The dissected specimens come from 2 miles south of Cataño (JN1), Puerto Rico (ANSP. 177530). Although conchologically very similar to *Euvaricella, Vagavarix* is anatomically the most divergent subgenus of *Varicella,* and has little in common with *Varicellina* except its unicuspid radular teeth.

Foot more elongate, lightly pigmented; tail flat dorsad, with evident median sulcus; tentacles paler. Mantle collar pale, narrower; lappets larger, pigmented. Lung with pale areas; 4 times base or kidney (1.3 base or pericardium). Spermathecal sac (f. 12) constricted by aorta. Epiphallus opening at half length of verge (uncovered at PV). Radula (f. 13) has 124 rows (T) of 89–101 slender aculeate teeth; 1st centrifugal longest; ribbon 3.5 mm. long.

V. (Vagavarix) calderoni H.B.B. Notulae Naturae 88: (1941).

The type (ANSP. 177551) has been dissected.

Like *V. portoricensis* but: Lung much paler although apex

spotted. Spermathecal sac much shorter and stouter, but also constricted; stalk more swollen in basal half. Flagellum about .6 as long as shorter epiphallus proper, which has a knob-like caecum opposite vas entrance and opens at .3 length of verge, that is as long as penis and attenuate apically. Penis much larger, as long as limbs of epiphallus below or above retractor; weakly plicate inside. Atrium shorter. Radula with 164 broadly V-shaped rows of 95 teeth; 3.1 mm. long.

V. (VAGAVARIX) SPORADICA H.B.B. Notulae Naturae 88: (1941).

The type (ANSP. 177532) has been dissected.

Like *V. sulculosa* but: Foot darker dorsad; mantle lappets pigmented. Lung (and apex) much darker; about 4 times base or 3 kidney. Gonad with 3 divided alveoli (more like *V. portoricensis*). Free oviduct longer; vagina and base or spermathecal stalk more swollen. Flagellum with a vermiform appendix on its caecum; retractor inserting on epiphallus proper $\frac{1}{3}$ latter's greater length below vas entrance. Penis and verge relatively smaller. Radula with 78 rows of 41 teeth; length 2.5 mm.

V. (VAGAVARIX) SULCULOSA (Shuttleworth), pl. 2, figs. 14–15. *V. s.* and *V. impressa terebraeformis* (Sh.), Pils., Man. Conch. 19: 119–121.

The figured animals, of the typical form, were collected at the type locality, near Humacao (ES3), Puerto Rico (ANSP. 177531). The smoother form (*terebraeformis*), which occurs in damp places or those with good cover, and weakly pigmented animals, with uniformly whitish shells, were also dissected. *V. sulculosa* is but distantly related to the type of *Vagavarix* and approaches *Sigmataxis* in its radula and flagellum.

Like *V. portoricensis* but: Tail rounded above, with weaker groove. Mantle lappets pale, larger. Lung with sparse spots (more on apex); 5 times base or almost 4 kidney (1.2 base or 1.4 pericardium). Ovotestis (omitted from f. 14) has 4 small fans of 3–8 alveoli each. Flagellum caeciform, often much shorter than in f. 14; epiphallus opening near tip of verge. Radula (f. 15) with 46 rows (T) of 35 teeth; 2.1 mm. long.

SIGMATAXIS LAEVIUSCULUS (C. B. Adams), pl. 1, figs. 6–7. *Spiraxis l.* Pils., Man. Conch. 19: 35.

The dissected animals come from near Montego Bay (VCMa), Jamaica (ANSP. 168357). Their radular teeth are twice as long as those of the giant *V. leucozonias*. Although *Sigmataxis* is now

accepted as generically distinct from *Varicella*, its anatomical differences are not much greater than and similar to those of *Vagavarix*.

Like *Varicella* but: Foot and mantle collar pale. Lung pale, 2.7 times base or 3 kidney (little over its base or pericardium). Flagellum (f. 6) much reduced; epiphallus opening at ⅓ length of verge (uncovered at PV); penis with 2 beaded pilasters. Radula (f. 7) with 35 teeth in 29 rows (T); increase in centrifugals out to 4th or 5th more marked; almost 0.9 mm. long. [*S. procerus* has more elongate lung, vestigial flagellum and shorter, simple penis, almost filled by large cylindric verge. Radula with 27 teeth in 29 rows; central .4 length of 1st (over .1 mm.).]

Laevaricella (s.s.) interrupta (Shuttleworth), pl. 2, figs. 16–17. *V. i.* Pils., Man. Conch. 19: 126.

The figured animal was collected near summit of the Ponce-Adjuntas road (PR2), Puerto Rico (ANSP. 177533). Unlike the other Puerto Rican oleacinines, *L. interrupta* is quite arboreal. The Haitian *V. denticulata suturalis* Pils. (Man. Conch. 19: 211) seems also to be a *Laevaricella*. Despite its geographic propinquity, this genus is very distinct from *Varicella*.

Like *Varicella* but: Foot (alive) very long, whitish on sides, shading to light brown near sole, top of head and tentacles; sole large and abruptly expanded. Mantle collar and lappets with brownish edges. Lung (and apex) pebbled with diffuse pigment; 3.5 times base or kidney (1.2 base or 1.4 pericardium). Thick walled swelling of spermathecal stalk lined by folds. Vas looping up through penial sheath and down in penial wall, to open at tip of vergic fold (EP, free only at tip) near middle of penis. Penis (lower .7 and all sheath opened lengthwise) fusiform, with thinnish wall and continuous lumen; apical .6 (epiphallus + flagellum?) internally with beaded pilasters; basal .4 (penis proper) lined by close papillae, with flat squarish tips (detail at P increased 7.5 times), which also cover stimulator (PP; free .3 of length). Radula (f. 17) with 81 rows (T) of 99 teeth; centrifugals increasing slightly out to 4th, with small outer 10–12 more spatulate; 4.5 mm. long.

L. (Boriquena) playa (H.B.B.), pl. 2, figs. 18–20. *V. p.*, Naut. 53: 107 (1940).

The figured animal (38 mm. shell) was collected near Old Loiza (EN1), Puerto Rico (ANSP. 177535). Evidently, *L. playa* is almost sectionally distinct from *L. glabra*.

Like *L. glabra* but: Foot lighter, shading from white sole to brownish gray dorsum; tentacles paler. Lung with black network or rows of spots (as on apex); 4 times base or almost 3 kidney (over twice pericardium). Spermatheca (f. 19) with thin walled swelling of stalk. Vas opens ¼ way down principal of 7 epiphallic pilasters. Verge uncovered and penial sheath half cut way in f. 18. Atrial opening slightly less than halfway back head. Radula (f. 20) with 113 rows of 187 teeth; length 9.5 mm. Right eye muscle in atrial angle.

L. (BORIQUENA) GLABRA (Pfeiffer), pl. 1, fig. 4. *V. g.* Pils., Man. Conch. 19: 127.

The dissected animals were collected on El Yunque (ER4), Puerto Rico (ANSP. 177534). In penial reduction, *Boriquena* parallels *Vagavarix*.

Like *L. interrupta* but: Foot (alive) with dark brown bosses and cream sulci; tail much shorter than head; tentacles dark. Edge of mantle orange with light border; lappets dark; glands orange. Lung (and apex) black; almost thrice base or 2 kidney (attenuate anteriad, 2 base and almost 2 pericardium). Carrefour shallowly imbedded; albumen gland (in f. 4) exhausted. Vas enters epiphallic apex, but runs down as plicate cavity in principal pilaster to near penis. Epiphallus with much thicker wall and containing 5 high thin folds besides broad pilaster. Penis (verge uncovered and sheath half cut away) and atrium papillate; opening near visceral stalk. Radula with 95 rows of 131 teeth; 1st centrifugal .15 mm. long and outer 4–5 spatulate; length 8 mm. Columellar muscle gives off shortly 2 retractors, each of which divides into buccal muscle and one to inferior tentacle, palp and mouth; then, soon after, 2 more, which divide in foot into eye and lateral retractors. Right eye muscle free from genitalia.

NOTES AND NEWS

EXACT DATES OF THE NAUTILUS.—Vol. 54 (1): pp. 1–38, pl. 1, was mailed July 23, 1940; (2): 39–74, pls. 2–5, Nov. 2, 1940; (3): 75–110, pls. 6–8, Feb. 4, 1941; (4): 111–146, pl. 9, May 5, 1941.—H.B.B.

DEROCERAS ON BAFFIN ISLAND.—In a recent article in these pages (53: 127–131), unaccountably I overlooked an earlier record of *Derocerας hyperborcum* West., published by Mr. Aurele La Rocque in the Canadian Field-Naturalist, 50: 142, Nov., 1936.

My specimens, which I identified as *Dercceras laeve* (Müll.), and those received by La Rocque were collected in the same locality—Lake Harbour, on the Hudson Strait coast of Baffin Island.—JOHN OUGHTON.

NEW RECORDS OF INTRODUCED LAND SHELLS IN SOUTHERN CALIFORNIA.—It has recently come to my attention that *Helix nemoralis* L. has been observed in nursery stock in Southern California. Inspectors of the Los Angeles County Agricultural Commission discovered immature individuals of this species on June 29, 1938, and on Oct. 28, 1940, in Los Angeles. Half-grown specimens were also obtained from a nursery in Redondo Beach, Cal., on Jan. 25 and Sept. 15, 1940. In all instances the mollusks were found on or under potted plants.

On Nov. 5, 1941, a Los Angeles teacher, Miss Mary Cornett, showed me a specimen of *Helix lactea* Müller collected in Elysian Park by one of her pupils. Subsequent search of the locality uncovered a colony of this species spread out over an area of about twenty acres. An effort was made to destroy the colony by Los Angeles County Inspectors, who gathered many specimens of all ages. It was evident that the colony had been established there for a long time. It was suggested that Italians living in the vicinity had imported them from Morocco or southern Europe, as a shipment of live specimens from Morocco was confiscated here several years ago.—HOWARD R. HILL, Los Angeles Museum.

OBSTRUCTIO VERSUS TROPICORBIS.—F. C. Baker, in a note in NAUTILUS, 53, p. 106, points out that *Obstructio* (Zool. Ser. Field Mus. Nat. Hist., 24: p. 99; 1939), which I described as a subgenus of *Planorbula*, cannot be subordinated to this genus. Baker, who probably knows more about Planorbidae than anyone else, refers *Obstructio* to *Tropicorbis* and makes it a plain synonym. From the anatomical details given by him, there can be no doubt about the correctness of shifting my subgenus *Obstructio* to *Tropicorbis*. But, while both the obstructed and the non-obstructed species of this last named genus showed identical features of their sexual organs, proving thus their close relationships, they obviously differ in their shell characters, *i.e.*,

by lack or presence of internal teeth and lamellae. I, therefore, wish to maintain *Obstructio* as a subgenus of *Tropicorbis*, which comprises the species provided with an internal obstruction.—FRITZ HAAS.

A WINTER THAW AS A FACTOR IN REDUCING A FRESH-WATER MOLLUSK POPULATION.—During a thaw in December, 1940, a small pool in Six Mile Creek, Ithaca, New York, was examined. The thick ice that had been on the surface of the pool had mostly melted, leaving but a thin sheet of ice over the pool. The water from the melted ice had drained away. Ten individuals of *Physa gyrina* Say which had been frozen in the ice were left stranded, unable to return to the water because of the thin ice cover which still remained over the pool's surface. A day after the examination of the pool a heavy freeze set in. At the end of 7 days the writer returned to the pool and observed that all of the mollusks which were stranded above the ice had been killed.—WILLIAM MARCUS INGRAM, Mills College, California.

ERRATA: In an article, "Daylight activity of Land Mollusks," the NAUTILUS, vol. 54, no. 3, pp. 87–90, two errors in the text are here corrected. In table 1 *Zonitoides arbreus* should read *Zonitoides arboreus*. On page 89 the word *in* of the following sentence should be changed to *on*. "The recorded data only concern snails crawling in the open on top of the forest floor humus or *on* logs . . ."—WILLIAM MARCUS INGRAM.

BULIMULUS ALTERNATUS MARIAE (Albers) IN ALABAMA.—While engaged in bringing the collection of North American Terrestrial Gastropoda in the Carnegie Museum up to date taxonomically a few years ago, I came across a *Bulimulus* that puzzled me, as nothing like it had been recorded from Alabama. Dr. H. A. Pilsbry identified it as *Bulimulus alternatus mariae*, the first time that this shell had ever been found in that state, and thereby constituting a new record for Alabama. The Carnegie Museum received these shells in the great collection given by Dr. G. H. Clapp. Dr. Clapp had received them from H. H. Smith, who in turn had gotten them from Dr. T. S. van Allen. The shells had been collected near Mobile, Mobile County.

There is the possibility that these shells were introduced into the area of Mobile on plants, as the animal has the habit of sealing itself to cacti, mesquite, coarse grass and shrubs, and even on fence posts and telegraph poles in southern Texas during the warm parts of the day. This case was cited by Junius Henderson (Naut., vol. 49, 1936, p. 105), who found colonies of *B. a. mariae* estivating near Corpus Christi, Texas; E. D. Crabb (Proc. Okla. Acad. Sci., vol. 2, 1922, pp. 10–11) found them cemented to vegetation near Fort Worth, and so numerous that their nearly white shells suggested that the prairie weeds were blossoming shells.

H. H. Smith, who received about a dozen of these shells from Dr. Allen, believed that they were brought into the Mobile area as ballast or other material from Texas.—Gordon K. MacMillan.

Tectarius muricatus (Linnaeus) in New England.—Scientists are cautious about any record that is based on a single specimen, especially if it is far from its usual latitude; but it is possible that sometimes such mollusks may breed and become established in distant places. In 1876 Mr. J. Henry Blake found a living specimen of *Tectarius muricatus* (L.) crawling up on a wharf pile at five feet from the ground, in Provincetown, Mass. The shell was presented to the Museum of the Boston Society of Natural History. No record for this species has since been made north of Florida. This specimen is labelled in the handwriting of the late Charles W. Johnson, who did not, however, include Mr. Blake's Provincetown record in his latest "List of Marine Mollusca of the Atlantic from Labrador to Texas," 1934, doubtless feeling that the mollusk is an accidental, for ships often bring semi-tropical animals, attached to the vessels or elsewhere. Other species have reached New England from the north in the same manner.

Mr. J. Henry Blake, who is well known as a scientific artist and associate of Louis Agassiz on the *Hassler,* in 1872, and later Curator of Mollusks at Harvard University, is now almost 96 years old, and not only very active mentally, but is still deeply interested in mollusks, and in science generally.—S. N. Sanford, April 20, 1941.

PUBLICATIONS RECEIVED

The Cuban operculate Land Mollusks of the Family Annulariidae, Exclusive of the Subfamily Chondropominae. By Carlos de la Torre and Paul Bartsch. Proc. U. S. Nat. Mus. 89: 131–385 + i – x; pls. 9–57 (No. 3096). 1941. The figures in this exquisite monograph are superb, even if, through no fault of the authors, they have lost some of the details of the exceptionally fine original photographs. The text adds excellent and clear descriptions of these; at least, as illustrated by the type specimens. The keys are marvels of simplicity, although one may wonder if the shells are equally so. In this connection, the authors are to be highly commended for their demulcent reticence in matters of sex; such nasty minutiae might mar the rhythmic charm of presentation. Being masculine, they mainly ignore (*e.g.*, p. 231, key) the minuscule stature of the male in this unfortunate group. The bibliographies are equally succinct; opinion 31 of the International Commission and *Choanopoma* Pfeiffer (p. 281), as well as *Licina* Gray are omitted; and one hesitates in mention of a minor error in genus and volume quotation (p. 321, third entry). [But, numerous similar names are very difficult to keep straight; I get so lost in my own earlier zonitid alliterations, that my guilt almost subdues me.] Incidentally, sports do occur and *Troschelvindex* (p. 326) may be sportive, but they usually also re-occur, like the "breathing devices" and the loss of growth sculpture (called "lamellae") or calcareous plate ("lamella") on the operculum. All in all, the authors have completely finished the Cuban members of this family and, in so doing, have fallen little short of the good old-fashioned standards, as represented in the classic works of Reeve and Isaac Lea. Any future studies can only subtract from such imposing creations, which include, as new, 5 genera, 23 subgenera, 101 species and 120 subspecies, from one of the best-known islands. But, when all is said and done, the book ends well (p. 383), and does offer an excellent suggestion to younger students of the perplexing complex of minor divergences which constitute a tantalizing and world-wide family.—H. B. B.

Zonitid Snails from Pacific Islands. By H. Burrington Baker. Bernice P. Bishop Museum Bull. 158 (1938), 165 (1940), and 166 (1941). 372 pages, 65 plates. The Zonitidae and Helicarionidae are among the most generally distributed and specifically numerous families in the Pacific islands; but hitherto they have been the most difficult snails in that fauna to identify and the generic classification has been little better than chaotic. Much of this confusion has been owing to the simplicity and similarity of many of the shells, without definite generic differences, and to inadequate descriptive work; in only a few, such as *Trochomorpha*, were the shells large and strongly marked enough to be readily identified by existing literature.

The classification is now based almost wholly on the soft anatomy; and as Dr. Baker's is the most extensive single work ever published on zonitid anatomy, the data presented modify our ideas of the taxonomy and descent of this group far beyond the limits of Polynesia.

Many old species, even as far back as Beck, as well as little-known species of Gould, Pfeiffer and others, are now for the first time worked out. In all, 10 genera, 68 subgenera and named sections, and 136 species, more than half of the total number, are defined as new. The assembling of the great collection in the Bishop Museum upon which the work is primarily based, is almost wholly due to Dr. C. Montague Cooke, Jr.

In Part 4 the distribution is considered. "Because they probably did not originate as far back in geologic time as did the more primitive Orthurethra, they may not present very valid evidence in regard to the former land connections which have been inferred for this area. Nevertheless, their endemicity is quite high; 12 (35 per cent) of the 32 genera and 253 (95 per cent) of the 266 species are not known to range beyond the limits of the area studied."

The genera ranging or related eastward (America), are confined to the Hawaiian Islands with the single exception of *Euconulus conoides* of Tahiti. No less than 14 species of American affinities (plus 2 introduced) occur. "The most probable method by which the accidental introduction of these land snails might be accomplished, would appear to be their rare transport by

birds. As is known, certain of the latter, such as the golden plover, do annually migrate through Hawaii to islands in the south central Pacific and might occasionally transfer eggs, juveniles, or even adults. The discovery of *Euconulus conoides* on Tahiti gives some slight additional evidence in favor of a north and south direction of carriage, even if the Tahitian snail does appear to be more or less intermediate between mainland and Hawaiian members of the genus. If this hypothesis be true, the original ancestors of these interesting additions to the Pacific fauna would have come from the vicinity of Bering Strait, as agrees with their evident holarctic and nearctic affinities."

"The Microcystinae are the most characteristic subfamily of zonitid snails on Pacific Islands, and may have originated within this area."

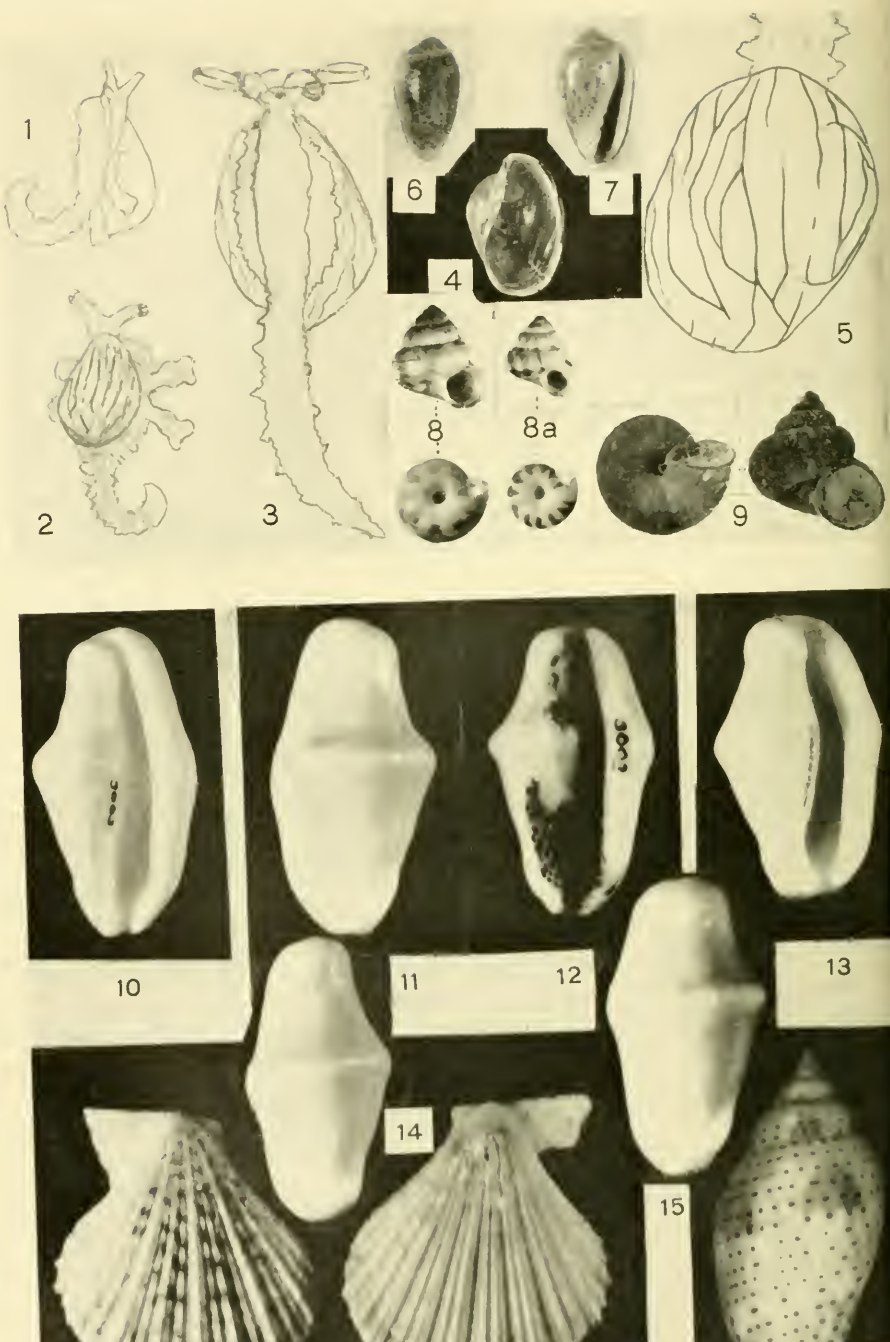
Dr. Baker concludes that:

"1. The Zonitidae and Helicarionidae are the most highly evolved pulmonate mollusks that have endemic members in most parts of the Pacific area and their immigrations have probably been relatively recent.

"2. With the exceptions of the oviparous Sesarinae and Trochomorphinae, they are all small species, or, like *Microcystis* and *Mendaña*, may well have been derived from minute ancestors and developed size within their present ranges.

"3. Perhaps for these reasons, their distribution does not seem to offer very definite evidence for (or against) a former Pacific continent or extensive land-connections in the area, but does seem to be mainly explicable on the hypothesis of adventitious dissemination."

It is a long step forward in Pacific zoology to have this dark place in Polynesian malacology illumined by Dr. Baker's outstanding treatise.—H. A. P.



Figs. 1–5, *Lobiger pilsbryi*. 6, 7, *Margunella hartlegana*. 8, 8a, *Japonia musiva*. 9, *Lagochilus scxfilaris*. 10–15, *Cyphoma megintyi robustior*. 16, 17, *Pecten imbricatus middendorfi*. 18, *Mitra florida*.

THE NAUTILUS

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A GENUS AND FAMILY OF MARINE MOLLUSKS NEW TO THE UNITED STATES

By JEANNE S. SCHWENGEL

Specimens of a Tectibranch taken in dredging in about 6 fathoms in the Gulf of Mexico off Sanibel Island, Florida, represent a species of the genus *Lobiger,* a genus not yet reported from the United States. This mollusk was taken from a mass of bright green seaweed to which it was perfectly assimilated in color and the irregular form.[1]

The animal (Plate 3, figs. 1–3) is elongate, not capable of being wholly contained in the shell; tentacles folded; eyes sessile; foot very long; epipodial ridges well developed, and giving rise to two wing-like lobes on each side as described below. As several authors describing Mediterranean and Pacific species of *Lobiger* have noticed, these lobes can be cast off by the animal when irritated. My specimens were not noticed until they had been some time on the board upon which the dredge was emptied, and the mass of weed, mud, shells, sea urchins and bottom debris had been picked over. By this time their lobes had evidently been lost, as no traces were noticeable (fig. 3). But in the time I kept them in my aquarium, short lobes had already grown out (fig. 2). They were not seen to use them as swimming organs.

The color of this mollusk is bright lettuce-green, which appears deeper in tint when placed upon green seaweed. The body surface is velvety, delicately reticulated and peppered with fine lines and dots of reddish-purple showing through the shell. The dor-

[1] Dr. Ruth Patrick kindly had this seaweed examined by the authority on algae, Professor W. R. Taylor, who pronounced it to be the species *Caulerpa crassifolia* (C. Ag.) J. Ag.

sal surface of the foot bears a granulation of minute, pale, slightly elevated papillae. The posterior dorsal part of foot and body bear two lateral rows of pale brownish papillae, some large and pointed, others smaller, rounded and less elevated; the intervening body surface is slightly granular.

The tentacles are four in number; an upper or superior pair of folded rhinophores, and a smaller lower pair, or labial processes, less than half as long, very contractile. The eyes are sessile, black, small, posterior to the base of the superior tentacles, at the junction of the anterior and middle thirds of a thin black line. The anterior third of this line is on a slightly higher plane than its extension posterior to the eyes.

There are four lateral parapodial lobes, as already mentioned, two on either side. They may be reflected over the sides of the shell or extended in lateral position, either synchronously or independently. These parapodial lobes as newly growing in my specimen are small, rather deeply concave with elevated and reflected borders on dorsal side, smooth and gray-green within the upper concavity, granulose on exterior surface.

The foot is long, pointed or bluntly rounded according to the mollusk's activity. The plantar surface is smooth. The foot can be attenuated and lengthened, made short and broad, or infolded laterally to grasp a stem or blade of seaweed. The animal can elevate itself upon the posterior extremity of the foot to an almost vertical position and when in this attitude the head and anterior part of the body are moved rhythmically from side to side and in half circles through a fairly wide arc, as though the creature was searching for a stem of weed or grass.

The animal can also creep in a reversed position upon the under side of the surface film. It descends from this situation by strongly arching the body, releasing the anterior portion of the foot, swinging free from the posterior tip of the foot and finally breaking away from its hold on the surface film by a strong contraction of the foot.

When disturbed, the creature may arch itself strongly upward, supported firmly upon the extreme anterior and posterior ends of the body, and annoyance is often manifested by the secretion of great amounts of clear, colorless mucus. From this arched

attitude the creature can assume an erect posture based either upon the anterior or the posterior extremity. My observations were made on two animals kept in a small aquarium where one of them lived about five weeks, February 20, 1941, to March 26.

The shell (fig. 4) is oval, involute, very thin and nearly transparent. The surface is closely and finely striate along lines of growth. Aperture greatly expanded. The columellar margin is reflected. My largest specimen is 12.5 mm. long, 8.5 mm. wide, with convexity of 5.5 mm. It is wholly external, the mantle only very narrowly covering the edges.

There is some difficulty about the specific name of this snail, as all of the described species have much in common. Descriptions of the six supposed species of *Lobiger* can be found in the Manual of Conchology, vol. 16.

The Mediterranean *Lobiger* was described in 1840 under the specific name *serradifalci* Calcara. In 1856 Fischer described a species from Guadaloupe. *L. souverbii.* This differs from the Mediterranean form by having only two epipodial lobes instead of four, one anterior, the other posterior; but as *Lobiger* has the faculty of self-amputating these appendages, it is quite likely, as Sir Charles Eliot has remarked, that *L. souverbii* was founded on a mutilated specimen. I cannot find that anything has been published about the markings of the mantle, under the shell, in the two above-mentioned species, and the published figures do not show any markings, but my Sanibel species shows very distinct reddish-purple lines on the mantle under the shell, as in fig. 5, a camera-lucida tracing of the mantle after death; these lines showing through the shell in the living animal, as described above. In the Mediterranean species the epipodial lobes or wings are oblong. In the Pacific *Lobiger viridis* Pease, and the Indian Ocean *L. nevilli* Pils. (as figured by Eliot from a drawing by Mr. Crossland)[2] the lobes are long and narrow, with deeply scalloped margins. In our Sanibel species we cannot tell which form would be assumed, as they had been cast off when it was found, and were apparently scarcely half grown in the specimen as drawn in fig. 2. This is an important point to be noticed when others are found.

[2] See Sir Charles Eliot, Journ. of Conch. 11: 307, for figures and description of *L. nevilli.*

In *L. souverbii* the lobes are shortly oval with regular outlines. In *L. serradifalci* anterior tentacles must be quite short, as they were not noticed. In *L. viridis* they are long. In our species they are quite noticeable in life, but not half as long as the rhinophores.

In *L. nevilli* of the Indian Ocean, there are "thin dark green lines, expanding here and there into blue blotches" visible through the shell. This species appears to differ from *L. serradifalci* in the shape of the wings, which are long, narrow, with indented margins. There are also differences in coloration.

The shells of all of the genus appear to be practically alike.

On the whole, it appears best to recognize the Sanibel form as distinct. It may be called

LOBIGER PILSBRYI new species;

mainly separated on account of the lines on the mantle (figs. 2, 5), which do not seem to exist in the Mediterranean *Lobiger*, or at least, they are not mentioned in the descriptions or shown in the figures of that species or *L. souverbii*.

Plate 3, figs. 1, 2, are sketches of the living animal in oblique and dorsal views, the epipodial lobes partially grown out. Fig. 3 is a view from below as the animal appeared when first taken; length about 28 mm. Fig. 5 is a camera lucida drawing of the mantle of largest specimen, the shell removed, showing pattern of lines. In the other specimen there are more numerous similar lines (by error, this figure was reversed on the plate, the anterior end being placed below).

The type figured has been placed in the collection of the Academy of Natural Sciences, No. 178025, the smaller specimen in my own collection.

NOTES ON THE GENUS *LAGOCHILUS* BLANFORD, WITH SPECIAL REFERENCE TO ITS CHINESE SPECIES

BY TENG-CHIEN YEN[1]

Lagochilus was a manuscript name of Theobold, published as a subgenus of *Cyclophorus* Montfort by Blanford in 1864 (Ann.

[1] Work was done with a grant-in-aid from the Johnson Fund of the American Philosophical Society, Philadelphia, Pa.

Mag. Nat. Hist. Lond., III (13), p. 452), having designated *C. scissimargo* Benson as its type-species and included *C. tomotrema* Benson as another known species of this subgenus. *C. scissimargo* was described by Benson in 1856 from Tenasserim of Burma, and later on, it was figured by Pfeiffer in 1860 (Novit. Conch., II, p. 144, pl. 37, figs. 19–21) and Reeve in 1861 (Conch. Icon., XIII, sp. 105). Subsequently, it has been repeatedly recorded from Burma and its neighboring regions like Cambodia and Tonkin.

Since then, *Lagochilus* has been generally recognized as a distinct group of *Cyclophorus* by authors of Pfeifferian times, and occasionally adopted as a genus, by Stoliczka as well as Crosse. In 1885, Paul Fischer, in his Manuel de Conchyliologie, treated it as a distinct genus of Cyclophoridae. In the same year Moellendorff (Jour. As. Soc. Bengal, 54 (II), p. 67), linked its relationship with *Japonia* Gould, based on some specimens from F. W. Eastlake which he identified as *Japonia barbata* Gould, and considered it to be congeneric with species of *Lagochilus,* particularly with those being described from China. But he suggested that, if necessary, *Japonia* should be retained as a minor group of *Lagochilus,* despite the priority of the former. His view was partly based on the circumstance that *Japonia* was not sufficiently known by its original description, and partly because *Lagochilus* had been so well established. In other words, his conclusion was without sufficient morphological background; and yet in his work in 1897 (Nachbl. d. m. Ges., 29, p. 82), which was in collaboration with Kobelt, this suggestion was adopted by them.

Now then the confusion begins. Kobelt in 1902 (Das Tierreich, 16 Lief., Cyclophoridae) accordingly transferred a great number of species, hitherto considered as *Lagochilus,* into *Japonia,* and reversed Moellendorff's procedure by placing *Lagochilus* as a subgenus of *Japonia* on account of its priority. His treatment was followed by Gude 1921 (Fauna of British India, Mollusca, 3, Land Operculates) and Thiele in 1929 (Handbuch der systematischen Weichtierkunde). But Kobelt himself seems to have never investigated the status of *Japonia* and what its 3 original species really are.

Japonia was proposed as a group of *Cyclostoma* by Gould in

1859 (Proc. Bost. Soc. Nat. Hist., 6, p. 425) included his three new species, two of them described from Oushima, an island of Japan, and one without an exact locality, however, it is said also probably from Japan. These species are so in this order: *Cyclostoma barbata, Cyclostoma citharella* and *C. musiva.* Except that in 1885 there was a questionable record of *C. barbata* by Moellendorff (*l.c.*), none of these species has been elsewhere recorded. In Pfeifferian times, this group was generally treated as a section or subgenus of *Realia* Gray. No type-species was originally designated by Gould, and not until 1878, Kobelt (Ill. Conch., p. 200) made *C. barbata* its genotype. The valid name of *C. barbata,* in fact, should be *Japonia gouldi* Kobelt 1902 (*l.c.,* p. 60) because *C. barbatum* was preoccupied by Pfeiffer in 1855 for a Bornean species.

In examining the Gould's type-specimens described from the North Pacific Exploring Expedition, I have searched the material still available in New York State Museum in Albany and U. S. National Museum in Washington, D. C., and I have found 2 examples representing *C. musiva* in Gould's collection now in possession of New York State Museum. Very unfortunately no specimens have been found for *C. barbata* (that is *J. gouldi* Kobelt), and C. *citharella.* I think that they must be considered as lost.

So far as these 2 specimens of *C. musiva* are concerned, representing one of the 3 original species of *Japonia,* they seem to be different from the typical forms of *Lagochilus.* They are illustrated in Plate 3, figures 8, 8a. For comparison I figure *Lagochilus sexfilaris* (Heude), Plate 3, figure 9. The figures are about 3 times actual size. How far Gould's other 2 species agree with *Lagochilus,* remains questionable, since their type-specimens are no longer accessible and they are not sufficiently known by Gould's original descriptions without figures. But, nevertheless, judging by the size, they are small, about $\frac{1}{8}$ of an inch or a little more than 3.0 mm. in diameter. No species of *Lagochilus* has been so far reported as approaching that dimension. Even the 2 Chinese species *L. trichophorus* Moellendorff and *L. sexfilaris* Heude, as mentioned by Moellendorff (*l.c.*, p. 68), to be the close forms to Japonia, are almost twice the size of one-eighth of an

inch. Moreover, Kobelt's designation in 1878 of *C. barbata* as the type of *Japonia*, which was then considered by him as a subgenus of *Realia*, does not add any more detail to the original description of that species and genus. So that by insufficient knowledge of the species, as already pointed out by Moellendorff, and lack of original material to prove their definite identification, *Japonia* remains a doubtful group. There is no reason to include the definitely known species of *Lagochilus* in such an indefinite group as *Japonia*.

On the other hand, the available material of *C. musiva* does not show its congeneric features with *L. scissimargo*, while such Chinese species as *Lagochilus glabratus* Moellendorff, *L. clathratus* (Heude), *L. hungerfordianus* (Moellendorff), *L. longipilus* (Moellendorff), *L. pellicostus* (Moellendorff), *L. pilosus* Moellendorff, *L. sexfilaris* (Heude), *L. tenuipilus* Gredler, *L. trichophorus* Moellendorff, etc., do show close resemblance to the genotype. In changing these species, and others as well, from *Lagochilus* to *Japonia*, Kobelt did not restudy the authentic material of *Japonia* to fix its exact position before he drastically included from different groups more than one hundred species and varieties under the general heading of *Japonia*, and no fewer than 20 species, mostly from *Lagochilus*, in its restricted sense. It is evident that such changes were merely because of observing the law of priority that *Japonia* precedes *Lagochilus*, but not on comparison of the morphological features of authentic material of both groups, from which their systematic positions can be better ascertained.

NOTES ON FLORIDA MOLLUSCA, WITH DESCRIPTIONS OF TWO NEW VARIETIES

By TED BAYER

During the past few years several new records for the United States, as well as two new varieties of marine mollusks, have been brought to my attention, and I take this opportunity to present them to students and collectors at large.

Conus echinulatus Kiener. Some time ago a peculiar *Conus* turned up from Hillsborough Inlet, which could not be assigned to any familiar local species. Finally some specimens were sent

to Mr. Hugh Fulton of London, and he kindly identified them for me. His letter of August 28, 1940, reads, in part: "The box with the little cones arrived today. They are *Conus echinulatus* Kiener, which Tryon put as a variety of *verrucosus* Hwass. Its granulation separates it from *verrucosus* but there are possibly intermediates that link them together." We have not seen such intermediates; on the contrary, the shells on hand are very constant in character of sculpture. There is wide variation in color, however. The shells range from straw color and brown to rosy and lavender, with darker mottling. The animal is white or cream colored.

PYRENE MERCATORIA Linnaeus. During the first few days of January, and again in August, 1941, the author collected specimens of *Pyrene mercatoria* on Garden Key, Dry Tortugas, that far surpass any other Florida specimens in size. These very large shells were found in the same areas that were frequented by typical *mercatoria*. The largest typical *mercatoria* collected was 15 mm. in length, and the largest of the large form was 21 mm. The large form is rather consistent in size, averaging 19.3 mm., while typical *mercatoria* range between 11 mm. and 15 mm., with an average of 13.6 mm. In addition to larger size, this shell has finer spiral sculpture, bearing from 19 to 22 spiral costae, against 10 to 12 for typical *mercatoria*. In color the large form runs from yellow and brown mottled to almost solid black, with only a few streaks of pure white. The typical *mercatoria* ranges between brown mottled and pure white. Opinion is withheld until further studies and observations are made on both shells.

CYPRAEA EXANTHEMA Linn. and C. EXANTHEMA CERVUS Linnaeus. While collecting at the Tortugas in January and again in August, some remarkable specimens of these two shells were found. All were very much smaller than normal, though otherwise quite mature. The largest *C. exanthema* was 50 mm. long, and the smallest only 39. The largest *C. exanthema cervus* was 62 mm. and the smallest only 50. These specimens came from Garden Key, where Dr. B. R. Bales also reported finding them in the early spring. In all, six specimens were collected, three of the *exanthema* and three of the variety. The reason (or reasons) for this dwarfing of *Cypraea* is not apparent. Other

species of marine life tend to grow larger than normal in this region of pure water and abundant food.

Mitra florida Gould. Plate 3, figure 18. During the past half year, two good specimens of this fine Florida shell have come to light, one from the Dry Tortugas, the other from the lower Florida Keys. The specimen of this species from the Dry Tortugas was collected by the author on Loggerhead Key, January 3, 1941. The other specimen was obtained by A. H. Patterson, with exact locality not given. The latter example was found still containing the animal, and is no doubt the best and largest specimen as yet brought to our attention. Although this species has been known for many years, it remains missing from most Florida check-lists, and should certainly be added.

Natica sulcata Born. During March of 1939, two living examples of this shell were found on the sand-bar at Peanut Island in the Palm Beach Inlet, by the present author. In the fall of the same year another living example was found at approximately the same place, but in a grassy station. Early in the following year a living specimen was dredged west of Peanut Island in the Intracoastal Waterway channel by Captain and Mrs. E. S. Vail. Then, during the subsequent summer, specimens were collected by Mr. and Mrs. Donovan, as reported in the Nautilus 54: 2, page 71.

Cyphoma mcgintyi robustior nov. var. Plate 3, figures 10–15.

During 1939 some very peculiar specimens of *Cyphoma* were obtained, which were collected by Greek sponge divers in the northern part of the Gulf of Mexico, probably in Apalachee Bay. The affinity of this mollusk definitely lies with *C. mcgintyi* Pilsbry (Nautilus, 53: 1, page 2) as the animal remaining in one specimen clearly indicates. The mantle pattern consists of solid brown spots on a white background.

Shell similar to *C. mcgintyi;* broad, thick and heavy. The transverse dorsal ridge is high and very prominent; the callus is thick and very strong on the right, sharply defined; callus more diffused on the left, though moderately thick; callus at the apex of the spire elevated dorsally into a little knob. Color, white, with a diffuse light fawn or lavendar tint on the back; callus and dorsal ridge snow white. Length of holotype 39 mm., width 19.5 mm.

Holotype as yet in the author's collection, cat. 3003, paratypes in the author's collection, and the collection of Mr. and Mrs. J. W. Donovan.

Pecten (Chlamys) imbricatus mildredae, nov. var. Pl. 3, figs. 16, 17.

Left valve rayed with eight rather prominent ribs and from 1 to 3 interstitial smaller ribs between each major rib. Large and small costae armed with elevated scales placed at regular intervals. Lower valve rayed with rather prominent scaly ribs in groups which correspond to the major ribs on the upper valve. Auricles unequal, with seven teeth in the byssal aperture. Color, ranging from a brilliant red flecked with white, through brownish-purple mottled with paler tan, to pure white. Holotype pale brown, purple tinted at the margin, with spots of darker brown between the major costae. Lower valve pale tan or fawn, with faint suggestion of spotting. Interior yellow with clear purple at the margins and at the hinge. Alt. 37.5 mm.; lat. 32 mm.

Several factors link this shell with *imbricatus:* one is the similar scheme of ribbing; the enlarged, sometimes cupped scales; the yellow and purple interior; and the large size of individuals. Unfortunately, the type material selected by Frampton is not available. The shell ranges from Biscayne Bay to the Tortugas and the Bahamas. Holotype cat. 02948 in the author's cabinet; paratypes in collection of W. A. Royce. Named in honor of Mrs. W. A. Royce, who first collected it.

NOTES ON EPITONIUM (NITIDOSCALA) TINCTUM (CARPENTER)

By A. M. STRONG

In a paper, Notes on Some Species of Epitonium (Trans. San Diego Soc. Nat. Hist., vol. 6, No. 7, 1930), I have shown that *Scalaria tincta* Carpenter, described from Cedros Island (Cerros Island, Lower California) and San Pedro, *Scalaria subcoronata* Carpenter, described from Monterey, and "*Scala hindsii* Carpenter" Arnold, described from the Pleistocene of San Pedro, are all three based on specimens representing a single species. Since writing this paper many additional specimens have come to hand. Among these it is found that there is a notable difference in the shells from north and south of Point Conception, California.

The shell described and figured as *Epitonium* (*Nitidoscala*) *tinctum* (Carpenter) in the above mentioned paper, from Point Vincent, near San Pedro, may be taken as the typical form. It has 8 post-nuclear whorls and measures 12 mm. in length. An average shell from Monterey with 8 post-nuclear whorls will measure 14 mm. or more in length; also the northern shell appears to be heavier and somewhat broader. If it is desirable to recognize these differences the name *subcoronatum* Carpenter can be used in a subspecific sense for the more northern form.

These shells live in close association with sea anemones in sand pockets and sand-filled crevices in the rocks on the outer coast, where they are exposed to the wash of the surf. Recently Mr. and Mrs. Bormann of Long Beach, California, collected a large number of specimens of apparently a distinct variety, associated with sea anemones in the quiet waters of Mission Bay, near San Diego. They are smaller than the typical form, with the varices almost entirely lacking the coronation below the sutures and averaging about two more to the whorl. The brown line below the suture is faint but visible in most of the living specimens. These may take the name of EPITONIUM (NITIDOSCALA) TINCTUM, var. BORMANNI. The type has been deposited as No. 1064 in the type collection of the Los Angeles County Museum. It has a little more than 7 post-nuclear whorls and 13 varices. The measurements are: length, 7.2 mm.; diameter, 4.0 mm.

Dall (Bull. U. S. Nat. Mus., No. 112, 1921) gives the range of *E. tincta* as Monterey to the Gulf of California, and of *E. subcoronata* as Vancouver Island to San Diego. Due to the confusion in the use of names and the uncertainty of the older identifications, little reliance can be placed on these ranges. I have seen no specimens from north of Monterey or south of San Martin Island, Lower California. These points can hardly be taken as the limits of range for the species, but it is very doubtful if the species occurs in the vicinity of Vancouver Island or in the Gulf of California. A considerable number of specimens from Vancouver Island were all found to be referable to *E. indianorum* Carpenter. In the large collection of the California Academy of Sciences from many points in the Gulf of California no specimens were found closely resembling *E. tinctum* Carpenter.

A SURVEY OF THE WEST AMERICAN ALIGENAS WITH A DESCRIPTION OF A NEW SPECIES

BY TOM BURCH
The University of Southern California

This is a report on a group of small pelecypods of the genus *Aligena* Lea, with a review of the species from the eastern Pacific, including the description of one new to science. I am indebted to Dr. Myra Keen of Stanford University for her invaluable assistance in comparing types and verifying references, to Mr. A. Petersen of the Allan Hancock Foundation, The University of Southern California, for the drawings of the new species, to Dr. Paul Bartsch and Dr. H. A. Rehder of the United States National Museum for the other figures used, and to Dr. Olga Hartman of the Allan Hancock Foundation.

Genus ALIGENA H. C. Lea, 1843

Lea, H. C., Proc. Amer. Phil. Soc., vol. 3, p. 163, 1843 (Sept.); Trans. Amer. Phil. Soc., Ser. 2, vol. 9, p. 238, 1845.

Dall, Trans. Wagner Free Inst. Sci., vol. 3, pt. 5, p. 1175, 1900.

Genotype: *Aligena striata* H. C. Lea, 1845 (by subsequent designation, Dall, 1900) (= *A. aequata* (Conrad), 1843).

ALIGENA AEQUATA (Conrad), 1843

Amphidesma aequata Conrad, Proc. Phila. Acad. Sci., vol. 1, p. 307, 1843 (Oct.).

Aligena acquata (Conrad), Dall, Trans. Wagner Free Inst. Sci., vol. 3, pt. 3, p. 919, pl. 24, fig. 8, 1895; *ibid.*, vol. 3, pt. 5, p. 1175, 1900.

This genus was originally (1843) described as follows: "Testa aequivalvi, subaequilaterali, postice et antice clausa; cardine dente cardinale uno, sulco sub natibus longo, minime profundo." Two names, *A. striata* and *A. laevis*, were assigned to it, unaccompanied by figures or descriptions, but followed (1845) with characterization. Dall (1900, p. 1175) designated *A. striata* as type of the genus and placed it in synonomy with *Amphidesma aequata* Conrad (1843).

At the same time Dall recharacterized the genus as having "a rounded triangular inflated shell with only a single small anterior tooth under the beaks, separated by a gap from the surface of attachment, under the posterior dorsal margins, of an elongate

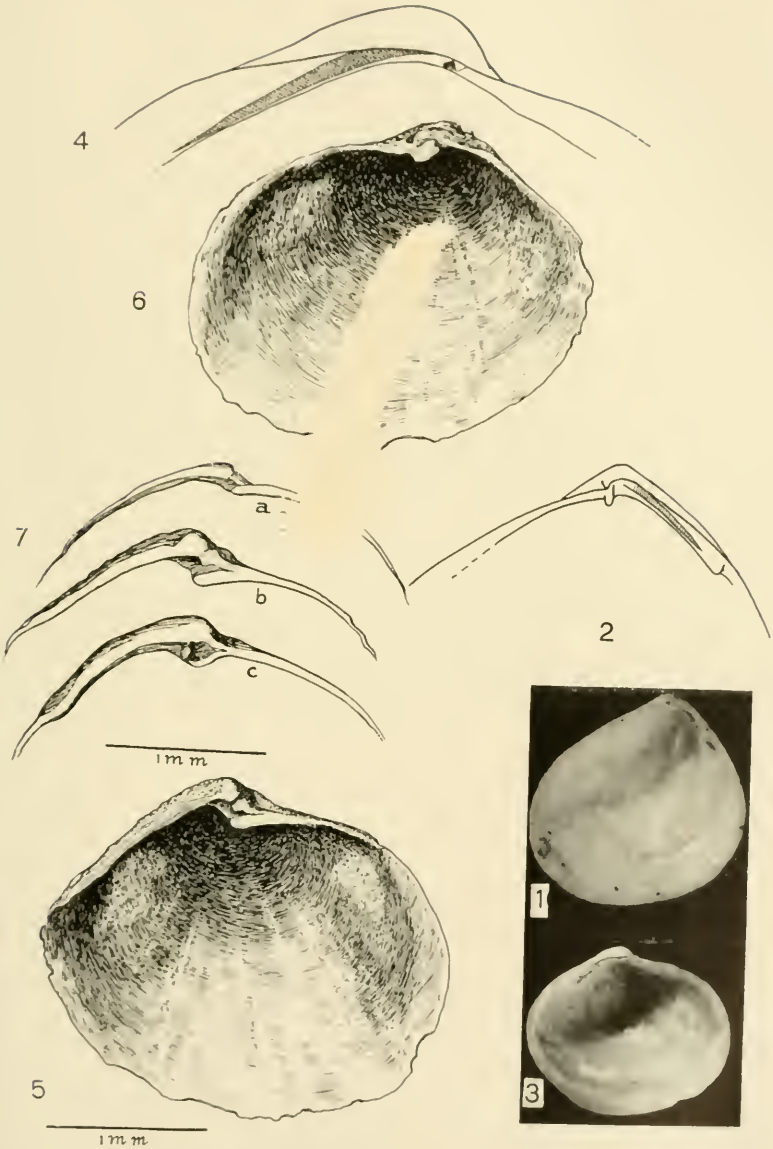

Fig. 1, *Altigena corritensis* Arnold, type; 2, hinge of right valve. 3, *A. nucea* Dall, type; 4, hinge of left valve. 5, *A. redondoensis*, type, left valve; 6, right valve; 7, a–c, range of hinge variation.

internal resilium carrying a lithodesma. The pallial line is simple, and the cardinal of the left valve is more feeble than the other."

Aligena is known from the Pacific Coast of the Americas through three species—(1) *A. cokeri* Dall, (2) *A. cerritensis* Arnold, and (3) *A. nucea* Dall. A fourth, *A. redondoensis*, is now added. These species are believed to be separable as indicated in the following key:

Shell with a median radial constriction ..... *A. cokeri.*
Shell without a median radial constriction.
  Anterior part of shell sloping abruptly down..... *A. cerritensis.*
  Anterior part of shell not sloping abruptly down.
    Posterior portion of shell sloping gently down, left valve with a tooth ..... *A. nucea.*
    Posterior portion of shell sloping abruptly down, left value edentulous ..... *A. redondoensis.*

ALIGENA COKERI Dall, 1909.

Proc. U. S. Nat. Mus., vol. 37, No. 1704, p. 155, pl. 28, fig. 5, 6.

This is a Peruvian species and is one of the larger species on the coast, the type measuring 7.5 mm. in length. The hinge is edentulous with a small callosity in front of the ligament. It is about the shape of *A. nucea* Dall, but has a median radial depression.

ALIGENA CERRITENSIS Arnold, 1903. Pl. 4, figs. 1, 2.

"Palcont. & Strat. of San Pedro," Mem. Calif. Acad. Sci., vol. 3, p. 138, pl. 13, fig. 3, 1903.

A. cerritensis was described from the Pleistocene of San Pedro, California, and has been reported from La Jolla, California, to Magdalena Bay, Mexico (Dall, 1921). The chondrophore of a topotype in the Stanford University Collection consists of a lamina which might almost be called a buttress, as it recedes into the shell above the posterior adductor muscle scar. The shell resembles *Acila castrensis* in outline and size. The type (figured) was described as being 8.5 mm. long and 8 mm. high. It is U.S.N.M. 162529.

ALIGENA NUCEA Dall, 1913. Pl. 4, figs. 3, 4.

Proc. U. S. Nat. Mus., vol. 45, No. 2002, p. 597; *ibid.*, vol. 66, art. 17, p. 2, pl. 28, fig. 2, 1925.

This was described from the Gulf of California. The shell was said to have the "beaks posterior, the anterior end of the shell shorter." Obviously the anterior end would have to be longer, if the beaks are posterior. The hinge of the left valve is described as having "a long, strong narrow chondrophore with a small pustular projection in front of it." Between the chondrophore and the small tooth is a triangular socket for the reception of a tooth from the other valve. The chondrophore to which Dall refers is a little laminar plate ventral to the ligament (see fig. 4). The type (figured) is 4 mm. long; the anterior portion, 1.75 mm. long; and its height is 3 mm. It is U.S.N.M. 267149.

Dr. Keen informs me that the *Aligena nucea* Dall of her *Check-list of West North American Marine Mollusca*, 1939, based on U.S.N.M. lots No. 211882 and No. 331316a from 48 fathoms off Santa Rosa Island and 129 fathoms off La Jolla, California, respectively, is *Aligena redondoensis* and not *A. nucea* as identified by Dall.

ALIGENA REDONDOENSIS sp. nov. Pl. 4, figs. 5, 6, 7.

During the summers of 1938 and 1939, while dredging in seventy-five fathoms in the submarine canyon off Redondo Beach, California, I recovered about seventy specimens of a minute pelecypod. After comparing specimens with the types of closely related species in the United States National Museum, Dr. Myra Keen of Stanford University and Dr. H. A. Rehder of the National Museum pronounced them a new species of *Aligena*.

The shells apparently live in a very limited ecologic habitat which occurs off Redondo Beach in but one very small area which is difficult to locate. The mollusk lives in mud mixed with some fine grey gravel. On all sides of this gravel bed the pure mud is barren of shells when compared with the rich fauna associated with the *Aligena*. Reference has already been made to the two lots of this species in the United States National Museum from off Santa Rosa Island and La Jolla, California.

Description: A minute, fragile, rounded, inflated shell with beaks somewhat posterior and twisted slightly forward; anterior portion longer, rounded, upper edge of shell posterior to umbones nearly straight and sloping abruptly down at an angle of about 45° with the hinge line, lower part of posterior extremity

rounded; shell sculptured with incremental lines only, color white; all specimens covered with a chocolate brown mud very hard to remove; hinge shelf below the apex somewhat broader than in other forms of this genus; hinge with a long, narrow chondrophore like *A. nucea;* left valve edentulous, with a laminar plate extending forward from below the umbo to the dorsal margin of the shell, leaving a depressed area below the umbo, into which fits a single large tooth from the right valve; muscle scars large, pallial line weak and simple.

Dimensions: length, 2.6 mm.; of anterior portion, 1.5 mm.; height of shell, 2.4 mm.

Variation: The shape of the shell is fairly consistent, but the lamina in the left hinge ranges from being practically obsolete (fig. 7a), to being pronounced and resembling a spoon-shaped chondrophore (fig. 7b, c). In the most extreme variant there is a rounded pit above the spoon-like lamina behind which is a narrow nymph-like thickening resembling a tooth (fig. 7c).

Type locality: Burch station 3833 in 75 fathoms off Redondo Beach, California, about latitude 33°38′50″, longitude 118°26′30″.

Holotype: No. 382, Allan Hancock Foundation, The University of Southern California.

Paratypes have been distributed to: Stanford University Paleo. type collection, No. 6924; The Academy of Natural Sciences of Philadelphia; the United States National Museum; The California Academy of Sciences, The San Diego Society of Natural History, and the collections of George Willett, A. M. Strong, and S. S. Berry. The remaining paratypes are in the collection of the author.

OUTLINE OF AMERICAN OLEACININAE AND NEW SPECIES FROM MEXICO

By H. BURRINGTON BAKER

This is part 8 of a series on Mexican mollusks collected for Dr. Bryant Walker in 1926. The first part appeared (1928) as Occasional Papers Mus. Zool. Univ. Michigan, no. 193, in which symbols for localities are explained on pp. 2–25. The types of all new species will be in the University of Michigan Museum of Zoology. In the plate, the small numbers over the scales indicate their lengths in millimeters.

Dissections of 48 species show that my former brief definition of the Oleacininae (NAUT. 54: 135) might more accurately read:

Kidney primitively triangular but becoming very oblique and much broader than long; ureter opening near apical corner of lung, which becomes strongly venate in advanced groups (exc. smallest species); genitalia without evident talon and with epiphallus primitively well developed; jaw absent; radular central usually well developed and centrifugals with dominant mesocone and mainly without ectocones (exc. *Varicella*); salivary glands forming a ring around oesophagus (not complete in *Eustreptostyla*); S-loops of hindgut large; shell elongate, imperforate (exc. *Oryzosoma*), with continuous or intermittent (varix) growth and with variously modified columella.

New subgenera are: *Singleya,* type *Euglandina singleyana* (W.G.B.); *Cosmomenus,* type *E. cumingii* (Beck) from Venezuela (Occ. Papers Mus. Zool. Univ. Mich. 156: 43, pl. 11, f. C, D); *Guillarmodia, Ghiesbreghtia, Proameria* and *Shuttleworthia.* The older group names, within the range of this paper, are listed in order of priority.

Oleacina Röding (1798),[1] *Streptostyla* Shuttleworth (1852), *Chersomitra* Martens (1860),[2] *Strebelia* Crosse et Fischer (1868), *Euglandina* C. & F. (1870),[2] *Salasiella* Strebel (1877), *Oryzosoma* Pilsbry (1891),[1] *Pittieria* Martens (1901),[1] *Laevoleacina* Pils. (Aug., 1907), *Rectoleacina,*[2] *Streptostylella,*[1] *Peteniella*[1] and *Varicoturris*[1] Pils. (Dec., 1907), *Laeviglandina,*[2] *Varicoglandina*[2] and *Flavoleacina* Pils. (1908), *Eustreptostyla* H.B.B. (1927), *Streptostylops* Pils. (1933),[1] *Perpusilla* H.B.B. (1941).

In the following key, which outlines the anatomically known American groups, each subgenus or section is followed by its type species.

1. TRIBUS VARICELLARUM; epiphallus (mainly with flagellum) continuous with penis; prostate as long as uterus; minor lung veins indistinct; labial palps smallish; (12) spermatheca above aorta and shell able to contain animal; (13) ureter along margin of triangular kidney, with moderately broad and oblique base; left mantle-lappets widely separated; (25) vas deferens unbranched; Antillean: genera *VARICELLA, SIGMATAXIS, LAEVARICELLA.*[3]

[1] Anatomy completely unknown.

[2] Anatomy of type species not known.

[3] Subdivisions and types outlined in NAUT. 55: 25 & 49: 21.

2. STREPTOSTYLARUM; like 1 but epiphallus a swelling of vas deferens distant from penis; prostate absent near uterine apex; minor lung veins prominent (exc. smallest species); labial palps moderate; kidney with broader, more oblique base; (7) shell columella truncate, with involute edge; Central America to Haiti: .....genus *OLEACINA* or *Salasiella*?
3. Like 2 (anatomy unknown) and (4) shell solid, opaque, closely and evenly striate; Haiti:
subgenus *Oleacina* (*voluta*) s.s.
4. Like 3 but shell (under 12 mm. long) thinner, very glossy and smooth or with few grooves; (5) epiphallus entering penial apex through long verge; (6) penis with solid-tipped lateral branch; Panamá to Mexico:
subgenus *Salasiella* (*O. joaquinae*).[4]
5. Like 4 but epiphallus enters, without verge, distant from penial apex; shell usually larger; Cuba (to Haiti?):
subgenus *Laevoleacina* (*O. oleacea straminea*).
6. Like 5 but epiphallus enters penial apex; (4) penial branch filiform or absent; Haiti:
subgenus *Flavoleacina* (*O. mülleri*).
7. Like 2 but columella with thickened, reflected, twisted edge and not markedly truncate; penis without large verge; epiphallus often absent; Costa Rica to Haiti(?):
genus *STREPTOSTYLA*.
8. Like 7 and penis with (9) lateral branch (without solid tip) and (10) epiphallus like 4–5; shell usually with rather high spire and columella appearing truncate from behind; Cuba (to Mexico?): .....subgenus *Rectoleacina* (*S. cubensis*).
9. Like 8 but penis without branch and (10) containing a large stimulator; salivary ring open below; shell with strong growth-threads below suture; Mexico:
subgenus *Eustreptostyla* (*S. nicoleti*).
10. Like 9 but without (8) epiphallus or stimulator; salivary ring closed; shell thinner and smoother; (11) penis very long, with retractor arising and inserting above diaphragm; inner radular teeth not greatly increasing; shell appearing biconic; mainly Mexico:
subgenus and section *Streptostyla* (*streptostyla*) s.s.
11. Like 10 but penis moderate, with retractor arising from diaphragm; inner teeth doubling in length; shell more fusiform; Costa Rica to Mexico: section *Chersomitra* (*S. nigricans*).
12. Like 7 (ureter and mantle-lappets unknown) but (1) spermatheca short; reduced shell bulliform; penis apparently simple and without epiphallus; Mexico:
genus *STREBELIA* (*berendti*).

[4] Section *Perpusilla* defined in NAUT. 54: 82.

13. EUGLANDINARUM; like 2 but (1) ureter diverging some distance from transversely ligulate, extremely oblique kidney; left mantle-lappets basally continuous; labial palps long; penis without verge; epiphallus often absent; (25) shell with evident sculpture or with growth-varices or less than 12 mm. long; South America to Florida: .....genus *EUGLANDINA*.
14. Like 13 and (18) shell less than 10 mm. long, with twisted columella; (19) epiphallus long; (21) radular central well cusped; no "crop" observed; left mantle-lappets demarcated only by greater height of posterior one; shell fairly glossy, with impressed growth-varices and thickened peristome; (24) right eye muscle free from genitalia; Mexico:
subgenus *Varicoturris*.
15. Like 14 (anatomy unknown) and (16) shell chestnut in color, with highest spire, with later whorls costulate and strongly angulate well below suture, and (17) with columella strongly twisted; .....section *Streptostylella* (*E. botteriana*).
16. Like 15 but spire less high and later whorls with color bands preceding varices, with low growth-threads and (17) forming an angulate cord at suture;
section *Ghiesbreghtia* (*E. flammulata*).
17. Like 16 (anatomy unknown) but (15) columella less twisted and suture simple; .....section *Varicoturris* (*E. dubia*) s.s.
18. Like 14 but shell more than 14 mm. long, with longer columella not twisted, lower spire, very low growth threads or regular striae and striking color bands; Guatemala and Mexico: ..... subgenus *Varicoglandina* (*E. monilifera*).
19. Like 18 but (14) vas slender; (20) shell less than 12 mm. long, with weak growth-striae and without color bands (like 4 but more solid); Mexico:
subgenus and section *Guillarmodia* (*E. pupa*).
20. Like 19 but shell more like 18, although usually with stronger growth sculpture and more obscure color bands:
section *Proameria* (*E. saxatilis*).
21. Like 20 but (14) radular central with very short cusp; anterior left mantle-lappet overlapping posterior; oesophagus forming "crop"; shell usually dullish, without distinct growth-varices or thickened peristome:
subgenus *Euglandina* s.s.
22. Like 21 but (23) penial retractor arising on left side of columella muscles; (24) shell with low embryonic whorls and regular growth-wrinkles, which are surmounted by close spiral striae and tend to coalesce into even sutural cord; Venezuela to Yucatan: *section Cosmomenus* (*E. cumingii*).
23. Like 22 but penial retractor arising from diaphragm as usual; Brazil (?) to Texas:
section *Singleya* (*E. singleyana*).

24. Like 23 but (14) right eye muscle in atrial angle; (22) shell with high embryonic whorls, or with coarse spirals that cut irregular growth-wrinkles into bars, or without evident spirals; Venezuela and Ecuador to Florida:
section *Euglandina* (*aurata lignaria*) s.s.
25. Like 14 but (1) slender vas deferens with branch to female side; (13) shell (over 18 mm. long) smoothish, without varices; columella, spire, radular central and mantle-lappets various: ..... genus *PITTIERIA* or *Laeviglandina?*
26. Like 25 (anatomy unknown) and shell with long straight columella (very slightly twisted) and high turrite spire; Costa Rica: ..... subgenus *Pittieria* (*bicolor*) s.s.
27. Like 26 but with lower spire; (28) shorter twisted columella, radular central and mantle-lappets more like 14; vas branch entering vagina through alveolate gland; Panamá (?) to Mexico: ..... subgenus *Shuttleworthia* (*P. arborea*).
28. Like 27 but columella of medium length, central and lappets more like 21; vas branch entering atrium through internally plicate bulb: Panamá to Mexico:
subgenus *Laeviglandina* (*P. underwoodi*).

OLEACINA? (SALASIELLA?) CAMERATA, new species. Pl. 5 figs. 4–5.

O? camerata is known only from 2 dead shells; the badly broken type, from Tepexic, below Necaxa, alt. 2200 ft., and a juvenile example (f. 4) from above, alt. 4925 ft. This slender species has the shortest spire and the largest whorls of any of the known forms of *Salasiella;* in its cord-like columella, it approaches *Streptostyla* and, in shell texture, *Chersomitra. Salasiella* and *Laevoleacina* appear congeneric but the shells of *Oleacina* s.s. also resemble those of *Laevaricella* (*Boriquena*).

Shell (f. 5) similar to *O. joaquinae* but with fewer bigger whorls, larger apex and shorter but more fornicate spire; thinner (more largely epidermal). Embryonic whorls about 1.5, assuming very fine growth-lines and obsolescent spiral striae. Later whorls more elongate; suture similar. Aperture much longer; peristome less emarginate below suture and thus appearing less arcuate below; columella thickened, cord-like and almost straight.

STREPTOSTYLA (EUSTREPTOSTYLA) NICOLETI ATYPICA, new subspecies. *S. n.*, form A, Strebel, 1877, Beitrag 3: 12, San Juan Miahuatlan.

The type shell was collected under a log in Rio Necaxa gorge, elevation 2625 ft. (D, I, a, 54). Strebel's form B, from Orizaba,

termed by Martens var. *subovata,* is much closer to the typical southern subspecies, received by Shuttleworth from near Córdoba, and which I collected at Sumidero, between them.

Shell like typical but with ribs more closely and regularly spaced, and with last whorl and aperture more tapering below. Form of type much like Strebel's pl. 7, f. 2b, but last whorl still more tapering; slightly immature, so columella and peristome little thickened.

	Alt.	maj. diam.	alt. apert.	diam. apert.	whorls
O? camerata					
(estimated)	8.91	38(3.41)	80(7.13)	28(1.97 mm.)	3¼
(juvenile)	4.88	49(2.31)	83(3.88)	34(1.33 mm.)	1¾
S. physodes	19.6	43(8.4)	54(10.5)	47(4.9 mm.)	7.3
S. n. atypica	30.6	49(14.9)	68(20.7)	46(9.5 mm.)	6.7
S. i. quirozi					
(usual)	32.7	45(14.8)	77(25.1)	39(9.7 mm.)	6.5
(high spire)	33.8	45(15.1)	72(24.5)	41(10.0 mm.)	6.6
S. vexans?	13.2	43(5.7)	64(8.5)	36(3.1 mm.)	5.7
E. flammulata	6.55	41(2.68)	33(2.13)	70(1.50 mm.)	7.8
E. stigmatica	17.4	41(7.2)	50(8.7)	53(4.6 mm.)	7
E. pupa					
(type)	8.25	42(3.48)	44(3.67)	54(1.98 mm.)	6.1
(sta. 3)	7.9	41(3.25)	46(3.65)	52(1.9 mm.)	6¼
E. saxatilis	19.2	34(6.50)	43(8.31)	43(3.58 mm.)	7⅝
E. s. convallis	21.2	39(8.3)	49(10.45)	45(4.65 mm.)	7.7
E. d. montivaga	19.1	41(7.8)	50(9.6)	43(4.15 mm.)	7.0
P. arborea	20.0	48(9.6)	41(8.3)	64(5.35 mm.)	7.6

EUGLANDINA (GHIESBREGHTIA) FLAMMULATA, new subgenus and species. Pl. 5, figs. 10–12.

The type locality is Las Tortolas, near Córdoba, elevation 2700 ft. (D, I, a, 4). *E. flammulata* is the type and only species of *Ghiesbreghtia,* which is defined in the key. Since it combines a spire similar to *Varicoturris* with a short twisted columella and a less marked sutural angulation approaching *Streptostylella,* these groups are probably quite closely related. In the growth-threads on its 2nd whorl and in its elongate epiphallus, it approaches the most primitive groups of *Varicella.*

Shell (f. 10) fairly solid, translucent, ovoid turrite; light buff with varices preceded by broad chestnut bands, which are broken near middle of last whorl; burnished although with low growth-threads. Apex ogival; embryonic whorls 2¾, quite high and soon

(on 1st) assuming very fine contiguous arcuate growth-threadlets, which, on 3rd, gradually change into neanic sculpture (like adult but weaker). Later whorls gradually increasing, narrowly truncated at suture by an angulate cord, below which are very low but angulate, quite evenly spaced (12.5 per mm. on last) major growth-threads with microscopic minor ones between, both becoming weaker towards base of last whorl, which is flattened below greatest width. Aperture small, narrowly truncate above and broad below; outer lip thickened internally and weakly concave where, as viewed laterally (f. 12) it is almost angularly arcuate. Columella very short and concave, with lightly thickened edge and so twisted that its abrupt truncation is only apparent when viewed from left side (f. 11); twist still broader in penult whorl.

EUGLANDINA (GUILLARMODIA) PUPA, new subgenus and species.
Pl. 5, figs. 8–9.

The type lot came from below Atoyac, 1300–1415 ft. (D, I, a, 1). *E. pupa* is the type of *Guillarmodia,* which has a shell similar to *Salasiella,* but with more, less rapidly increasing whorls, with lip arcuate farther from suture, and with more thickened peristome and columella. "*Salasiella*" *elegans* Martens (1895) seems closely related, but larger, more corneous, with regular and more whorls and with columella more concave and heavily thickened.

Shell (f. 8) rather solid, translucent, elongate ovoid; uniform porcelain-white or very pale buff; almost polished although with obsolescent growth-wrinkles. Apex parabolic; embryonic whorls 2.6, quite high, almost smooth until 3rd, which assumes neanic sculpture; suture with fairly wide bevel. Later whorls irregularly increasing (variable), with occasional varices, but with close microscopic growth-wrinkles (or striae) extremely weak; suture widely beveled, weakly impressed. Aperture smallish, broadest near base; outer lip well thickened internally, almost vertical below suture but strongly arcuate near middle (f. 9). Columella moderately long, concave and obliquely truncate, with thickened edge.

EUGLANDINA (PROAMERIA) SAXATILIS, new subgenus and species.
Pl. 5, figs. 2–3.

The type came from below Necaxa, elevation 3000 ft. (D, II, a, 53). *E. saxatilis* is the type of *Proameria,* which is used to include *E. conferta, E. polita,* probably *E. cordovana* and perhaps all the species of the original *Varicoglandina,* except the brightly

banded typical group. *E. saxatilis* is rather similar to *E. dalli* in shape, but has higher 2nd and 3rd whorls, much shorter later ones, longer and straighter columella and much more marked growth-sulci. The figures of *E. delicatula* show a much less attenuate base and stouter whorls.

Shell (f. 2) moderately thin, translucent, slender, turrite, gradually tapering above and more abruptly below; very pale olive brown with very slightly darker color bands preceding varices; highly glossy although with regular sulci. Apex domed; embryonic whorls 2.7, moderately high, with first 2 almost smooth and then assuming growth-sulci; suture very widely beveled. Later whorls gradually increasing, flattened, with regularly spaced growth-sulci (66 + 4 varices on last), which are quite deep at suture, where they separate low rounded growth-threads, have more flattened interspaces on sides of whorl, and become shallow towards base of last; spiral striae microscopic and practically obsolete; suture quite widely beveled. Aperture small, attenuate above and narrowing below; peristome weakly thickened internally, almost vertical (lateral profile in f. 3) below suture and but weakly arcuate near middle; columella fairly long and weakly concave.

E. (P.) SAXATILIS CONVALLIS, **new subspecies.** Pl. 5, fig. 1.

The type locality is Tepexic, below Necaxa, elevation 2215 ft. (D, I, 55).

Shell like typical but much stouter. Later whorls more convex, with considerably stronger growth-threads (90 sulci and 4 varices on last) which are subangulate below suture. Columella more concave.

E. (P.) DELICATULA (?) MONTIVAGA, **new subspecies.** Pl. 5, figs. 6–7.

The type locality is above Necaxa, elevation 4925 ft. (C, II, 35).

Apparently like *E. delicatula major* (Martens) in form (f. 6) but with much weaker growth-sculpture. Like *E. saxatilis* in sculpture, but with broader and more obtuse apex, larger whorls, less attenuate base and with color bands slightly more evident; embryonic whorls much lower; last whorl with 79 sulci + 3 varices and with slightly less obsolete spiral striae; suture less widely beveled throughout; aperture broader below; peristome (profile in f. 7) more arcuate near middle; columella shorter and more concave (even than in *E. s. convallis*).

PITTIERIA (SHUTTLEWORTHIA) ARBOREA, new subgenus and species. Pl. 5. figs. 13–15.

The type locality of this arboreal species is below Necaxa, elevation 3120 ft. (D, I, e, 52), where it was fairly frequent. *P. arborea* is the type of *Shuttleworthia*. It is apparently quite closely related to *P. ambigua* (Pfr.), but has a shorter last whorl and aperture; its columella is usually shorter and more concave although quite variable; and it differs in color, as also from *P. difficilis* (C. & F.), which has more convex outlines. *Streptostyla chiriquiensis* Mts. and *S. viridula* Angas more remotely resemble this group.

Shell (f. 13) thinnish, turrite, with conic spire and broadest near base; opaque whitish, tinted with brownish or lavender, especially on spire and rarely in axial streaks, with bright chestnut, forming a band below white subsutural line, and on columella; quite polished, although with weak growth-sulci. Apex parabolic; embryonic whorls almost 3; last 2 fairly high; last assuming weak growth-sulci; suture widely beveled and not colored. Later whorls gradually increasing, somewhat convex, with very irregular, weak and often intermittent growth-sulci and striae, which are often broken or strengthened by injuries; suture quite widely beveled, weakly impressed. Aperture short and broad; outer lip thin, almost vertical (f. 14) and scarcely arcuate. Columella typically short, concave, sigmoidly twisted and with white weakly thickened edge, but abruptly truncate as viewed from left (f. 15); may be moderately long, or much straighter, or less truncate (high climbs bring long falls).

The following notes complete the list of Oleacinidae collected in 1926.

Oleacina (*Salasiella*) *camerata* H.B.B., Necaxa, 2215–4925 ft., CD, III, dead, 35, 55.

Streptostyla (*Rectoleacina*) *physodes* (Sh.) good climber, Peñuela to Sumidero, 2625–3400 ft., AD, III, de, 3–6, typical form paedogenetoid; attains a size (see dimensions) even larger than f. *auriculacea* (Pfr.). *S. lymneiformis* (Sh.), rapid climber during rain, Sumidero, D, I, ede, 6. *S. meridana* (Mo.), Progreso. E, I, dead, 61; long and short spired forms.

S. (*Eustreptostyla*) *nicoleti* (Sh.), Sumidero, 3400 ft., D. I, a, 6. *S. n. atypica* H.B.B., Necaxa, D, I, a, 54.

S. (*s.s.*) *streptostyla* (Pfr.), Córdoba to Sumidero, 2625–3400 ft., AD, I, ab, 4, 6; f. *coniformis* (Sh.) which is larger (more whorls), lighter colored, less prominently streaked and has a higher spire, at Córdoba. *S. turgidula* (Pfr.), Córdoba, 2625–3000 ft., A, I, dead, 4. *S. plicatula* Strebel, Atoyac, 1300–1415 ft., AD, I, dead, 1; probably var. of preceding. *S. glandiformis* C. & F., Córdoba, 2625–3125 ft., AD, III, dead, 3, 5. *S. yucatanensis* Pils., Progreso, E, I, dead, 61.

S. (*Chersomitra*) *irrigua* (Sh.) Córdoba, 2625–3125 ft., AD, III, de, 4; dead, 3, 5. *S. i. quirozi* Strebel, Necaxa, 3120–5500 ft., BCD, III, a, e, juvenile, 35, 52; dead, 32, 33, 36, 41; growing larger (dimensions given); usually low spired but rarely approaching Strebel's "*S. shuttleworthi.*" *S. vexans* Strebel (?), Córdoba, 2625–3000 ft., D, III, dead, 4; one shell like *S. irrigua* but thinner, slenderer and with longer spire (see dimensions). *S. ventricosula* (Mo.), Progreso, E, I, dead, 61.

Euglandina (*Ghiesbreghtia*) *flammulata* H.B.B., Córdoba to Sumidero, 2700–3400 ft., D. I, a, 4, 6.

E. (*Varicoglandina*) *stigmatica* (Pfr.), Peñuela to Sumidero, 2625–3400 ft., AD, III, abcd, 3, 4, 6.

E. (*Guillarmodia*) *pupa* H.B.B., Atoyac to Peñuela, 1300–2950 ft., D, III, a, 1; dead smaller form, 3.

E. (*Proameria*) *saxatilis* H.B.B., Necaxa, 2625–4925 ft., CD, III, a, 53; dead young, approaching next, 35, 54. *E. s. convallis* H.B.B., Tepexic, 2215 ft., D. I, fresh, 55. *E. delicatula montivaga* H.B.B., Necaxa, 4500–4925 ft., BC, III, dead, 35, 37, 41. *E. cordovana* (Pfr.), Sumidero, 3400 ft., D, I, a, 6.

E. (*Cosmomenus*) *cylindracea* (Phillips), under rocks, Progreso, E, I, a, 6.

E. (*Singleya*) *candida* (Sh.), Atoyac, 1300–1415 ft., D, I, dead, 1; var. *conularis* (Pfr.), smoother with straighter columella, Potrero to Córdoba, 2150–3000 ft., AD, III, dead, 2, 4. *E.* sp?, Atoyac; more obtuse apex than *E. candida;* young.

E. (*s.s.*) *vanuxemensis* (Lea), Pirámides, under cacti, 7510 ft., E, II, a, 13; var. with typical columella and long aperture, but with closer whorls, and sharper sculpture approaching *E. michoacanensis* Pils., under maguëy, Guajimalpa, 9200 ft., C, II, a, 12. *E. sowerbyana estefaniae* (Strebel), Córdoba to Sumidero, 2625–

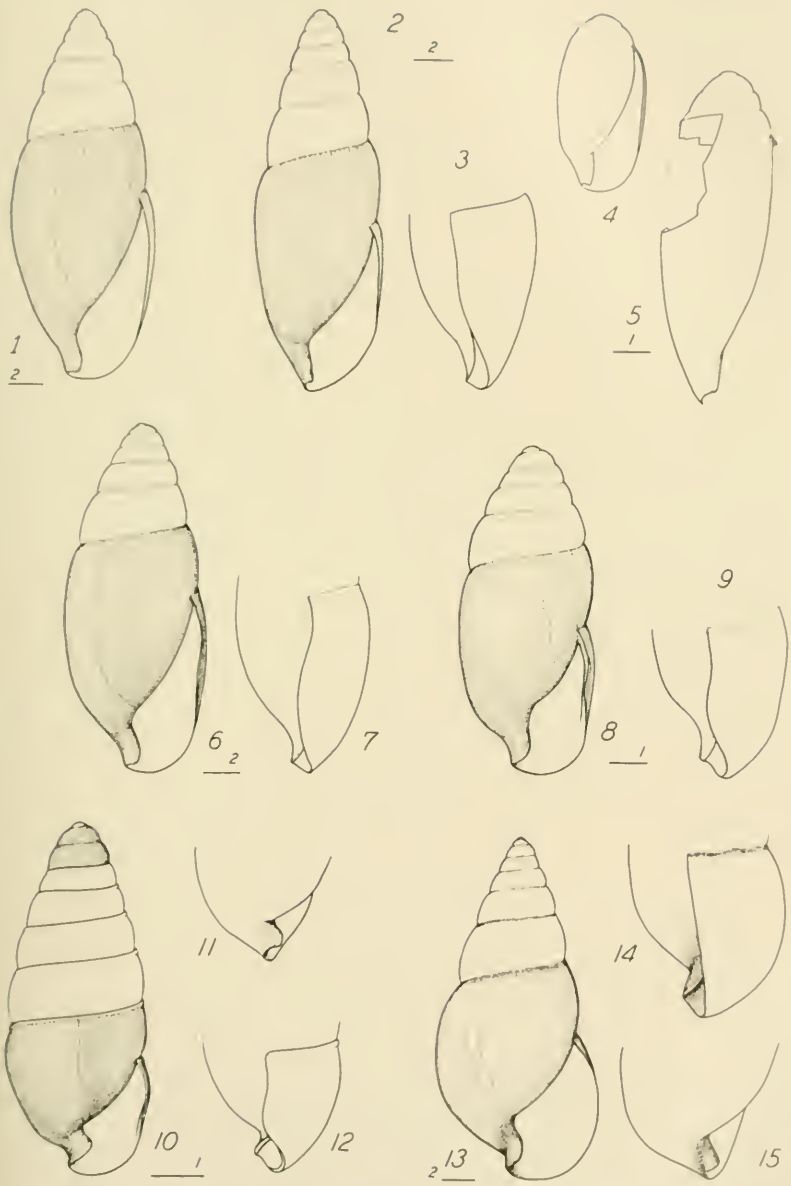

Fig. 1, *Englandina saxatilis convallis*. Figs. 2–3, *E. saxatilis*. Figs. 4–5, *Oleacina camerata*. Figs. 6–7, *Englandina delicatula montivaga*. Figs. 8–9, *E. pupa*. Figs. 10–12, *E. flammulata*. Figs. 13–15, *Pittiera arborea*.

Scale lines = 1 & 2 mm. as marked.

3400 ft., AD, III, dead, 4, 5, 6; immature, with typical small whorls and apex, but with swollen last whorl and more attenuate spire.

THE MICHIGAN *ARION CIRCUMSCRIPTUS* COLONY

By GLENN R. WEBB

In view of the potential usefulness which colonies of exotic species may serve in furnishing data on problems of zoogeography, the continued existence of *Arion circumscriptus* Johnston in Michigan should be reported.

According to Walker (1918), the first specimens of *circumscriptus* from Michigan were collected by Mr. Harold Cummins in 1913 at ". . . the 'Cat Hole,' a well-known sink-hole near Ann Arbor." Since then no other specimens seem to have been found at the locality, and recently it has been suggested that the species was unable to establish a colony (Goodrich, 1932). However, in the early part of 1939, Mr. John P. Ragsdale, Jr., found a thriving colony of the species at the Michigan University arboretum in Ann Arbor, Michigan, and collected several specimens. These were to be shipped alive to Indianapolis, Indiana, for comparison with specimens of the local colony there, but they spoiled en route and only one specimen was suitable for preservation. It is desirable that Michigan collectors discover if the colony still exists.

The source of the 1939 colony is problematic and represents either a separate introduction of the species or a continuation and extension of range of the old Walker colony. It may be that the species is wide-spread about Ann Arbor but only becomes locally or periodically sufficiently abundant to attract attention.

References

1918. Walker, Bryant, "Foreign Land Snails in Michigan," Occ. Papers Univ. Mich., no. 58, pp. 2–3.

1932. Goodrich, Calvin, "The Mollusca of Michigan," Univ. Mich. Handbook Series, no. 5, p. 42.

PUBLICATIONS RECEIVED

The South African Non-Marine Mollusca. M. Connolly. A Monographic Survey of South African Non-Marine Mollusca. Annals South African Museum. Vol. XXXIII. December 1939. 660 pages. 19 plates. The long awaited account of the South African snails, by Major Connolly, is one of the greatest contributions to the knowledge of the mollusca which have appeared in modern times, and we can only hope that so great a gift will be received as it deserves to be, as a guide and stimulus to collectors and students all over South Africa, and a text to be referred to by malacologists all over the world.

The South African snail fauna is a very rich one, 764 species being treated by Connolly. Many others will undoubtedly be found, but it seems certain that many of those now listed will eventually be reduced to the synonymy or treated as varieties. Connolly tells us that he has examined authentic examples, usually types or paratypes, of very nearly all the species, but in numerous cases the anatomy is still unknown, and very often the material is insufficient for a decision as to its specific standing. Under these circumstances, Connolly always gives the described species the benefit of the doubt, a very much better policy than that of some authors who make long lists of supposed synonyms without knowing much about them, and sometimes without even seeing specimens. Comparing the work with Pilsbry's treatment of North American land snails, now in course of publication, we observe that Connolly's account is much more condensed, and the knowledge available is comparatively limited. Pilsbry's book represents a much more advanced state of the science, and it will probably be fifty or a hundred years before the African fauna can be treated as exhaustively as the North American. By that time the North American snails will also have been more intensively studied, so that their treatment will advance a stage. It should be considered a great privilege,—open to all interested persons—, to have some part in this march of science through the decades.

Students of African natural history today have great advantages over their predecessors. With Connolly's account of the South African snails, and the description of the snails of the

Belgian Congo by Pilsbry and Bequaert, a large part of Africa has been covered in such a way as to make further work comparatively easy. Chapin's account of the Birds of the Belgian Congo, of which two volumes have been published by the American Museum of Natural History, contains an illuminating discussion of the zoogeography of Africa in general, while the botanists have been active in organizing our knowledge of the plants. A recent little book on Vegetation of South Africa, by R. S. Adamson (British Empire Vegetation Committee, 1938) should be read in connection with studies of the snails.

South Africa being deficient in lakes and rivers, it is not surprising that the freshwater molluscs are neither very numerous nor very peculiar. There is, however, an endemic genus *Tomichia,* which includes all the Hydrobiidae of the region. This genus has been minutely studied by Hugh Watson, whose results are all incorporated in Connolly's book. It is found that the species are numerous, and in addition to those recognized, *T. ventricosa* (Reeve) includes six races or closely allied species, with distinctive characters of the radulae, which are designated by Greek letters but not named. These shells occur in small lakes or ponds, where they are isolated and tend to develop distinctive characters. Among the land snails, Pilsbry and Bequaert (1927) cite twenty genera as restricted to the South African subregion. The most important are the Dorcasiinae, with three genera and numerous species, but the slugs *Apera* and *Oopelta* are very peculiar. The original *Oopelta* was described as coming from Guinea, which would take it out of the list of genera peculiar to S. Africa. As what appears to be the same species has been found in the Cape Province, and several related species occur there, the Guinea record is to be considered doubtful. If verified, the species might have been introduced from the Cape. The family Aperidae, with the genus *Apera* (*Chlamydophorus*) ranges from Cape Town to Natal with numerous species, which have been studied by Watson. *Sculptaria,* of which Pilsbry and Bequaert say "family uncertain," is referred by Connolly to the Corillidae.

Traveling in South Africa, one does not find regions where the snails are excessively abundant as in the Mediterranean region

and the Madeira and Canary Islands. At first sight, many of the species seem to belong to familiar genera, but great numbers of small shells, with the aspect of Pupillidae, belong in fact to the totally different family Streptaxidae; and many helicoid forms are found, on examination of the anatomy, to be little related to northern species having similar shells. South Africa has proved extremely rich in vertebrate fossils of different ages. It is probable that careful search will produce fossil shells, throwing much light on the ancestry of the African genera, but students of vertebrates rarely pay much attention to such things.—T. D. A. COCKERELL.

NOTES ON GIANT FASCIOLARIAS. By Burnett Smith. Palaeontographica Americana, vol. 2, No. 2, pp. 2–8, pl. 1. 1940. Dr. Smith uses the name *Fasciolaria papillosa* Sowerby, 1825, for the species generally known as *F. gigantea* Kiener, describing two subspecies: *F. p. duplinensis* from the Miocene of Duplin Co., N. C., and *F. p. acmensis* from Waccamaw Pliocene, Acme, N. C.; a specimen also found on the beach at Hatteras.—H. A. P.

NOTES AND NEWS

THE NAME *Pteranodon*.—With reference to the article by Dr. Haas (p. 20) it should be noted that the name *Pteranodon* is preoccupied (Marsh 1876) and so is not available in any case.—T. D. A. COCKERELL.

DR. HENRY D. RUSSELL has been appointed Assistant Curator of Mollusks at the Museum of Comparative Zoology, Harvard University, Cambridge, Mass. Dr. Russell has been associated with the Department of Mollusks since 1932 as a graduate student and later as Research Assistant.

THE CONCHOLOGICAL SOCIETY OF THE BAHAMA ISLANDS has recently been organized on New Providence, British West Indies. Mr. Paul D. Ford, its first president, writes: "Our meetings are growing in interest."

CORRECTION *re Myrsus* AND *Apolymetis*.—In the last number of THE NAUTILUS I published a note stating that *Myrsus* H. and A. Adams 1858 was a substitute name for *Metis* H. and A. Adams

1856 and should replace *Apolymetis* Salisbury 1929. Through some strange oversight I failed to note that *Myrsus* was a substitute for *Metis* H. and A. Adams 1857, proposed on page 436 of the Genera of Recent Mollusca, and not for *Metis* 1856 on page 399. The latter will still bear the name *Apolymetis* and for the *Metis* of 1857 the name *Katelysia* Römer 1857 is in use.—H. A. Rehder.

Marginella hartleyana, new species. Pl. 3, figs. 6, 7. Shell small, polished, spire slightly conic, with obtuse apex, of about 4½ whorls; suture shallow, aperture narrow and nearly as long as the shell, outer lip thickened and very slightly incurved. Four oblique plaits on the columella, the first, second and third being increasingly larger, the fourth diminishing to the size of the second. The shell is pale ochraceous-salmon color, thickly covered with minute, irregular flecks of ochraceous-salmon, which form three very faint, indistinct bands around the body whorl. There is a narrow band below the suture which is without flecks, and they evanesce toward the heavily bevelled lip, which is much paler in color, being almost white.

Length 8 mm., width 4.5 mm., type.
Length 7.3 mm., width 4 mm.

The Type 178026 A.N.S.P. was dredged off Santa Rosa Island, northwest Florida, in about 15 fathoms of water by Hartley Starkey, for whom the shell is named. Paratypes from the same lot are in the Beal-Maltbie Shell Museum, Winter Park, Florida, and in my collection.—Jeanne S. Schwengel.

New Localities for Helminthogypta californiensis Lea.—The range of *H. californiensis* as given in "Land Mollusca of North America North of Mexico" is given as Point Pinos to Point Lobos, a distance of about 20 miles. During the last 8 months I have resided at Pacific Grove and have collected this species at several localities outside of its published range. I have found it at several localities north of Monterey in the sand dunes, the farthest north being at Marina Beach, 10 miles north of Monterey, and I have collected it at 3 points south of Point Lobos, the southernmost being just south of the mouth of the Little Sur River, about 15 miles south of Point Lobos. Our best collecting, both as to number of specimens and size of shells, was in the sand dunes about 3 miles north of Monterey.—E. P. Chace.

MORE "CORDED" OLIVE SHELLS.—In THE NAUTILUS, vol. 54, p. 32, Dr. Louise M. Perry described and figured (plate 1, figure 7) specimens of *Oliva sayana* from Sanibel-Captiva, Florida, which bore "a well-elevated, rounded, cord-like ridge about 2 mm. wide, parallel with the suture and generally at or near the middle of the body whorl." Dr. B. R. Bales has sent us a similar example of this species collected by him at Bonita Springs, Florida. We have also an example of *Oliva incrassata* with the same peculiarity. It is from the gulf coast of Lower California between Angeles Bay and the settlement of San Felipe. It was obtained from a dealer. At Bolinas, Marin County, California, we collected one normally colored *Olivella biplicata* with this same feature. It is the only occurrence of this pathological anomaly in a series of 2757 specimens taken there.—D. S. and E. W. GIFFORD.

A SENATORIAL CONCHOLOGIST.—Benjamin Tappan who described *Physa sayii* appears in the history of Ohio as the second settler in one of the northern counties of the state, the founder of the town of Ravenna, presiding judge of a circuit court of common pleas and United States senator. Henry Howe, who might be termed a middle western collector of eccentricities, wrote that Tappan was "cross-eyed, with a pair of sharp black eyes and talking through his nose in a whining, sing-song sort of style." Like many of the frontier judges he was given to making informal pronouncements from the bench. For example, when wearied with a verbose lawyer, he called on him to "shut up! You don't know anything about it. You were a fool forty years ago, when I first knew you, and you have been failing every day since." Tappan politically was an almost violent Jackson Democrat; for all that, unlike Jackson, he was opposed to slavery He was sent to the United States senate by a Democratic legislature which found him acceptable on the ground of having an anti-slavery opinion apparently just short of abolition, whatever that could have meant. For a time he was the law partner of Edwin M. Stanton who became Lincoln's secretary of war. A sketch of Tappan's career says that he "devoted his last years to an interest in mineralogy and conchology." His life covered the years 1773 to 1857.—CALVIN GOODRICH.

A Sinistral *Succinea ovalis*.—The sinistral *Succinea ovalis* reported here was collected from beside a small stream at Ithaca, New York, on May 23, 1940. The writer sent it to Mr. Frank Collins Baker of the University of Illinois for identification confirmation. The following is a quotation from a letter received from Mr. Baker, "Number 2 [designation number] is very peculiar in being reversed, a very rare feature in this genus [*Succinea*]. Among some thousands of specimens of the genus *Succinea* in our collection there is not a single reversed individual. Number 2 is like some large forms of *Succinea* which I have referred to *Succinea ovalis optima* Pils., which attains a length of an inch." Gratitude is expressed to Mr. Frank Collins Baker for the identification of this rare specimen.—William Marcus Ingram.

The First Record of the Slug *Deroceras reticulatum* (Müller) in the United States.—This probable United States record was made possible through the identification of the slug, *Deroceras reticulatum* (Müller), by Dr. H. Burrington Baker of the University of Pennsylvania.

The two specimens of *D. reticulatum* sent to Dr. Baker were collected in late September 1940 at Ithaca, New York. These were taken from beneath flat stones overlying moist soil at the Cornell University Fish Hatchery. At the time of their collection others were found in a similar habitat as well as under several old piles of branches and beneath isolated stick and grass debris piles.

The writer believes that other individuals were taken in the fall of 1940 while he was conducting the Cornell University invertebrate zoology field course in the Louis Agassiz Fuertes Bird Sanctuary at the head of Cayuga Lake. Here the slugs were found beneath flat rocks, beneath water carried debris piles, and beneath discarded metal drain pipes. At the time these collections were made the soil was extremely moist and oozed under ones steps. Here, as well as at the original collection area, the slugs were active beneath their protective covering during daylight.

Thanks are due Dr. H. B. Baker for his courtesy in identifying this slug species. In his letter to the writer Dr. Baker states,

"This, I believe, is the first report [referring to *D. reticulatum*] of this species from the U. S., but undoubtedly it has been commonly confused with *D. agreste* (L.)."—WILLIAM MARCUS INGRAM.

IN THE FIELD IN UTAH: extract from a collector's letter.—Mrs. MacMillan and I have completed our collecting work for the present in Utah. Our first stop was at Moab, situated in the east central part of the state. We had a cabin in Arches National Monument at a place called Willow Springs. Close to the cabin a small spring sent a stream of water through a canyon for a mile or so before it disappeared in the sandy bottom. In the more shady sections of this canyon were small growths of willows, under which were patches of grass. At these spots I found at least two species of *Vallonia* and a small, blackish-gray slug, which I believe is *Agriolimax campestris.*

About a mile from the cabin the C. C. C. boys built a dam across a wash three or four years ago. Since then the lake has been filled and overflows after each storm. A species of *Physa* was clinging to most of the branches and other debris in the water. I am of the opinion that these shells were brought here by some wading bird, as at present no water exists in the wash beyond the dam except after a storm, and the water in the stream is not permanent except during the rainy periods. However, in the past there is the possibility that a stream did exist in this wash as also in the one of Willow Springs, which permitted the mollusks found here to migrate to these spots. Since that time meterologic changes have isolated these snails, which are now found only in scattered localities.

After spending a week at Willow Springs we moved to another section of Arches National Monument, at Salt Wash, where mollusk collecting was more successful. A mile or so from camp a stream cascaded down a series of steps, forming a number of ponds at each place, before it entered Salt Wash. Along each pond the shore was lined with willows and poison oaks, and under them the largest horse-tails that I had ever seen were growing. Underneath these horse-tails and crawling over the moist ground we collected two species of *Succinea* and *Agriolimax campestris.*

In the ponds and in the stream, even on top of the mountain, a species of *Physa* was found.

Following a week of inactivity in the field, but catching up on the material collected, we camped at Powder Wash, southeast of Jensen. During our week's stay here the work done was confined mainly to paleontology, working in the bad lands under a blazing sun with LeRoy Kay, assistant curator of Vertebrate Paleontology at the Carnegie Museum. In the exposures of sandstone, shales and sandy shales, we chiseled out jaws of small lizards and mammals, unearthed skeletons of fishes, and brought to light various kinds of plants and insects that lived upon the earth a few hundred million years ago. Our chief find was the skull and bones of a carnivorous animal, about the size of a coyote. Most of the bones were collected by screening the yellowish sand beyond the spot where the skull was first discovered. One day I was able to collect in a dry wash near the Green River north of Jensen for about half an hour. At this place the Green River emerges from a steep-walled canyon and most of the land on the broad flood plain beyond had been utilized for farming. During the time spent in this wash I was able to find only one *Succinea* which had been washed down there from some other place.

To compensate for the lack of present-day mollusks I collected a large series of fossil shells from the Wasatch and Green River formations, both of Eocene age. Most of the snails of the Wasatch formation were representatives of the genus *Pleurocera,* or at least that family. This was especially true of the lowest of the three outcrops, the one in which I was most interested, as I found imbedded in it two species of snails that look very much like *Cerion.* I will know more definitely about that when I have these snails removed from the matrix in which they now rest. The other two layers contain larger snails, mainly *Physa,* a large Planorbid, too flat for *Helisoma,* and a species or two of Unionidae. The snails collected from the Green River were all casts, but were so well preserved that I had no difficulty in recognizing the genus to which each specimen belonged. The genera most common were "*Planorbis,*" *Physa,* "*Pleurocera,*" *Viviparus* and *Lymnaea* (or their paleontological relatives). Conchologically yours.—Gordon K. MacMillan.

NEW NAMES FOR SUBDIVISIONS OF GONGYLOSTOMA.—In Manual of Conchology, XV, pp. 184–186, the subgenus *Gonglyostoma* of *Urocoptis* was divided into several named sections and a number of defined but unnamed groups subordinated to the section Gongylostoma. As these groups appear to be natural divisions and now contain many species, it appears advisable to have new sectional names for them, as follows. Definitions were given in M. C., vol. XV. These names have been in use in our collection for some years.

Scopulospica for the Group of *U. torquata* (Man. Conch., XV, p. 185). Type *Urocoptis torquata.*

Badiofaux for the Group of *U. trilamellata* (p. 185). Type *U. trilamellata* (Pfr.).

Poecilocoptis for the Group of *U. coerulans* (p. 185). Type *U. coerulans* (Poey).

Steatocoptis for the Group of *U. ventricosa* (p. 185). Type *U. ventricosa* ('Gdl'. Pfr.).

Nesocoptis for the Group of *U. pruinosa* (p. 185). Type *U. pruinosa* (Morel.).

Gongylostomella for the Group of *U. wrighti* (p. 186). Type *U. wrighti* (Pfr.).

Pleurostemma for the group of *U. geminata* (p. 165, section II). Type *U. geminata* (Pfr.).

H. A. PILSBRY.

THE ELEVENTH ANNUAL MEETING OF THE AMERICAN MALACOLOGICAL UNION

BY IMOGENE C. ROBERTSON, *Financial Secretary*

The American Malacological Union held its eleventh annual meeting in Thomaston and Rockland, Maine, from Tuesday to Friday, August 26 to 29, 1941, with headquarters at Crescent Beach Inn, Owl's Head. The convention was formally opened Tuesday afternoon by Dr. Harald A. Rehder, President of the Union, who introduced Norman W. Lermond, Director of Knox Academy of Arts and Sciences and of the Knox Arboretum, Thomaston. Mr. Lermond welcomed the visitors to Maine with its opportunities for rich molluscan collecting.

Reading of papers followed, the first being by Dr. Paul Bartsch on "The Progress of Studies on West Indian Cyclophoridae" by Drs. Carlos de la Torre, Paul Bartsch, and J. P. E. Morrison. "Land and Freshwater Shells Collected in South America in 1938 and 1939," by Walter J. Eyerdam, was read by William J. Clench, and Dr. Olof O. Nylander presented three short papers entitled "Mollusks at Low Tide in Eastport," "*Lymnaea stagnalis* in Houlton, Maine," and "*Lymnaea stagnalis* in Chaleur Bay, Quebec."

Mrs. Frank R. Schwengel was hostess to the group at a buffet dinner at six o'clock, and in the evening there was a showing of natural color photographs by Mr. and Mrs. Frank K. Hadley.

On Wednesday morning the meeting was opened by Dr. Rehder, and Dr. Fritz Haas presented "Some Life Habits of West Coast Marine Bivalves." Mrs. Schwengel followed with an account of a Floridian species of *Lobiger,* a genus new to the United States (printed in this number).

The rest of the day was devoted to the Symposium on "Methods of Collecting and Preserving Mollusca." Dr. B. R. Bales is Chairman of the Symposium Committee and had arranged the program although he himself was unable to be present. The papers were, "Freshwater Gastropods," by Frank Collins Baker, "Collecting Freshwater Bivalves," by Dr. Henry van der Schalie, "Collecting Land Mollusks," William J. Clench, "Shore and Shallow Water Collecting," Dr. B. R. Bales, read by Dr. Tucker Abbott, "Dredging for Everyone," by Tom Burch, read by Mrs. Schwengel; this dealt with dredging in California waters, and Mrs. Schwengel contributed notes on Florida dredging. The final contribution was by Thomas L. McGinty, "Diving as Applied to Shell Collecting," and was read by Harold R. Robertson. These papers were considered of such value to the membership and shell collectors generally that it was decided to print them as a special publication by the Union.

The annual banquet was held in the Inn at eight o'clock. Place cards made by Mrs. Edna G. Gordon of St. Petersburg and featuring an abundant Maine mollusk, *Littorina litorea,* were provided by Mr. Lermond and added much to the attractiveness of the long tables. Sixty-two partook of the delicious shore dinner served on this occasion.

Following the banquet the annual election of officers was held resulting as follows: President, Frank Collins Baker; Vice-President, Louise M. Perry; Corresponding Secretary, Norman W. Lermond; Financial Secretary, Imogene C. Robertson.

Adjourning to the Inn auditorium, a further program was given, consisting of a talk by Dr. Merrill Moore on "The Study and Collecting of Shells as a Form of Occupational Therapy," and a showing of natural color photographs by Harry B. Archer in which members attending the Toronto meeting in 1939 had an opportunity to see themselves "as others see us" as well as a rare treat in the numerous examples of exquisite coloring in Florida shells.

Thursday was made memorable by a boat trip to High and Andrews Islands for collecting. On Andrews Island a shore dinner "in the rough" was served with all the lobsters one could eat. In the evening the concluding program of papers gave "Hawaiian Winter," by William J. Clench, "Nudibranchs and Nematocysts," by Henry D. Russell, and "The Poison of Cephalopods," by Richard W. Foster. After this a clambake on the shore with roast corn and frankfurters. This entertainment was only one of the many acts of kindness and courtesy which the visitors at Crescent Beach Inn were constantly receiving from the proprietor, Mr. George D. Sleeper, and his cheerful and obliging staff, all of which were deeply appreciated.

On Friday morning came the regretful farewell to Crescent Beach Inn and our host, and a visit was made to the Knox Arboretum where Mr. Lermond welcomed the members and distributed souvenirs in the shape of more place cards, this time featuring another Maine native, *Thais lapillus*. The Knox Museum is an attractive building standing in the midst of an evergreen woods and housing a large collection of local and foreign shells in addition to numerous specimens of the flora and fauna of Maine. It was a privilege to inspect this museum, and its Director is to be congratulated on gathering together so many objects of interest and natural beauty. The series of *Spondylus* is unusually fine.

Here the convention was formally disbanded by the new President, Frank Collins Baker, and leave was taken of Mr. Lermond, to meet next year in Washington, D. C., if conditions permit.

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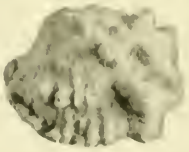

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Tamarackia quadrangularis Ad. & Rve. Fig. 1, cleaned valve. Fig. 2, normal uncleaned valve. Fig. 3, young uncleaned specimen. Fig. 4, surface N10, showing two central nodules.

THE NAUTILUS

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A REMARKABLE DEVELOPMENT OF PSEUDOSCULPTURE ON A BIVALVE

By WILLIAM J. CLENCH

Through the kindness of Mr. D. Thaanum of Honolulu, I have been privileged to study and report upon a very remarkable bivalve, *Samarangia quadrangularis* Adams & Reeve (Veneridae), dredged by Dr. Thaanum and D. B. Langford off the Loo Choo Islands, Japan.

This species is encased by agglutinated shell sand which completely covers the entire outer surface of the shell, formed as well into a very definite sculptural arrangement. This agglutination not only covers the shell with a thick layer of cemented particles, but, in addition, produces radial sculpture of high nodules that are strikingly similar to those occurring on many species in the Pectenidae, Unionidae and other strongly sculptured lamellibranchs.

The posterior portion of the disk supports the strongest development of the radial ridges of nodules, and these extend beyond the margin of the valve but are even with the valves when the shell is closed. Under a low power magnification (10×), the minute sand grains appear to be concentrically arranged, and are shingled or slightly overlapping (pl. 6, fig. 4).

Mr. Thaanum cleaned off the cemented sand grains on one valve of the larger specimen (pl. 6, fig. 1). The cleaned surface is shining with a minute and normal sculpture of very fine concentric growth lines. The opposite valve remained as originally found (pl. 6, fig. 2).

The smaller specimen (pl. 6, fig. 3) was dredged in 15 fathoms off Kowan, the larger specimen in 40–50 fathoms off Itoman; both localities are on Okinawa Island, Loo Choo Islands, Japan.

Measurements (including the pseudosculpture)

Height 43 Length 61 Width 30 mm. (M.C.Z. no. 141603)
" 16 " 21 " 11 " (Thaanum collection)

REFERENCES

Venus quadrangularis Adams & Reeve 1850, Voyage of H.M.S. Samarang, Zoology, London, p. 79, pl. 24, fig. 7 (Corean Archipelago); L. Reeve 1864, Conch. Icon. 14, *Venus,* species 129.

Samarangia Dall 1902 [section under *Venus*] Proc. U. S. Nat. Mus. 26, p. 361, type, *Venus quadrangularis;* Thiele 1934, Handb. Syst. Weichtierkunde, 3, p. 885 [as a genus].

J. E. Gray (Ann. Mag. Nat. Hist. (2) 4, p. 296, 1849) mentions the development of siliceous spicula superimposed erectly upon the normal periostracum of the shell in the genus *Trigona* [= *Tivela*] which forms a plush-like surface. He believed that these spicula were produced by the mollusk and not those produced by a commensal sponge, a belief held by certain of his colleagues. However, regardless of these two opposed views, our present case is still different inasmuch as the production of the pseudosculpture is the employment of a foreign substance by the mollusk itself and not, as in Gray's view, a production of the mollusk or, the view held by his colleagues, the production of a substance by a commensal organism upon the outer surface of the shell.

It would appear that the original specimen described by Adams and Reeve was devoid of this sculpture as no mention is made of it. The specimen obtained was either dead or perhaps subsequently cleaned before Adams and Reeve saw it.

Certain land snails, especially in the Sagdidae (*Thysanophora*), cement foreign particles to the outer surface of the shell, possibly to offer protection by modifying the contour of the shell outline. Also, in the case of *Xenophora,* among the marine snails, the cementing of other shells, small stones and even coal and cinders, is very well known.

It is rather interesting, however, to note that this present condition is to be found in a family perhaps most outstanding among the marine bivalves for their elaborate sculptural development; that the mantle, so adept in producing many shell structures on the outer surface, is also capable of building a pseudosculpture composed of a foreign material.

A PSYCHIATRIST'S NOTE ON SHELLS

By MERRILL MOORE, M.D.
Director, Washingtonian Hospital, Boston, Mass.

The collection and study of shells is a valuable form of occupational therapy and, properly introduced, can be a helpful adjunct to some forms of psychotherapy. Shells should be more widely utilized in these fields for the pleasure and interest they afford.

I believe that shells should be much more widely collected and studied by people, and that conchology should be more broadly and more generally applied on account of the psychological and social values inherent in its application. For example, I have found that certain tired, nervous and discouraged patients can find relaxation, recreation and enjoyment in collecting and studying shells. Some invalids and sick people who might otherwise be bored or irritable find considerable satisfaction and delight in conchology, once they are introduced to that subject and are helped and guided in developing their interest in it. Every sick child should be offered a box of shells to play with and should be given some instruction or a simple book to explain them. Shells are good for the mind, for "nerves." Buonanni was aware of this in 1681 when he published his book, "The Recreation of the Eyes and of the Mind through the Observation of Shells."[1] The ideas he expressed are basic to all scientific pursuits and are as valuable now as they were then, or more so, and certainly now they are more needed, and more applicable, than ever before, especially in a complex and competitive society.

The relations between science and society are extremely important. This fact should always be remembered when we think of the science of conchology—for we are too much inclined just to consider conchology as a science apart, to think of it in terms of itself, by itself and alone, and this is not really constructive.

There is no such thing as a pure science, pursuing its ideal

[1] "*Ricreatione dell' Occhio e della Mente* nell' Osservation' delle Chiocciole" Proposta a' Curiosi delle Opere della Natura dal P. Filippo Buonanni della Compagnia di Giesù Con quattrocento, e cinquanta figure di Testacei diversi, sopra cui si spiegano molti curiosi Problemi In Roma, per il Varese, MDCLXXXI con licenza de' Superiori.

course in a social vacuum. Shells exist certainly, but so do people and without people shells would be lying on the bottom of the sea—or in the stomach of an otter or a codfish, or would be ground to nothing on a beach unseen. It is the social or human interest in shells that has made conchology what it is today—man's curiosity applied—and this interest should always be kept actively alive (if conchology is to become a socially useful science in the fullest sense) by means of exhibits, museums, by teaching and lectures, and by the giving of shells to children and to others who might be interested in them—sick people, for example, or persons who are bored and need a hobby or special interest that affords opportunities for scientific development and social relaxation.

There is really no sharp or essential distinction between pure and applied science, although these terms still have a useful practical application and are convenient for us to use conversationally or as pegs or handles to help us deal with our thoughts.

The cruder forms of the doctrine of economic determinism should not apply to the science of conchology any more than they do to other human activities, or less, if anything, for shells are easy to find and, generally speaking, are cheap compared with other kinds of the world's goods. I know of no greater "value" than one gets in a 25-cent shell. It could not be reproduced for that sum. Beaches are accessible for millions of persons and the haunts of the land snails are accessible to all who will walk outdoors. As to shell dealers—"I often wonder what the vintners (shell dealers) buy, one half so precious as the wares they sell." Where can you get anything, or what can you get to compare with the beauty and wonder-making quality of a shell?

Just as science in general is a social function, so should the science of conchology in particular be a social function even though it also has its own momentum and is an activity which can be pursued for its own sake.

Conchology, in its own way, sets forth some of the essential facts about biology. Conchologists have an opportunity to develop our knowledge of certain basic facts and ideas in their relation to social life, and in the hands of the more inspired and dynamic leaders in conchology this has been done and it can be

done again in a pithy and illuminating manner. Witness the rich and choice diversion and instruction the literature on conchology can offer one who is willing to take the time to read it. Pilsbry's writings, for example, or Bartsch's papers, or those of Tryon or Sowerby, or any number that could be named offer us more than any one man can take in in his lifetime. We should be grateful to these men for pointing out to us what they have observed and for what they have suggested to us by their observations and reports. All these bear a direct relationship to general science and human activity as well, and many of the points they make and the inferences they draw are applicable to us in terms of our own life. Biology has much to say in explanation of human activity. Biology supports philosophy and psychology in the efforts of these branches of knowledge to explain human behavior. Man is such a peculiar organism that his behavior needs a special set of categories for its description over and above those of biology, but we can begin with biology and profit by so doing. Of course we realize at the beginning the limitations of biological explanations for human activity. But, nonetheless, biological categories are basic for human affairs and it is useful to have them so clearly set forth as conchology can begin to set them forth. I know of no point where a scientific education can better begin than by an introduction to conchology. Science and sanity, science and mental health are deeply related. Conchology should be more widely introduced and more widely utilized in teaching and recreation and in therapy. I hope a day may come when the educational system of this country has been revised to take conchology more actively into consideration. Conchology should be a more important part of the educational programs of secondary schools. Science courses and nature projects in high schools and colleges should be altered to include conchology as a basic unit of practical study. Conchology is a branch of the tree of knowledge that is strong and beautiful enough to attract and hold the interest of the student. Any parent, or teacher, or physician who has wit and intelligence enough to try this out for himself will find that the bough is still golden, and every conchologist is fully aware of that fact.

OBSERVATIONS ON *MITRA FLORIDA* GOULD

By TED BAYER
The University of Miami, Florida

Mitra florida has been the source of no little confusion to conchologists since its description in 1856 by Augustus A. Gould, inasmuch as the soft parts have heretofore not been obtained. The specimen found by A. H. Patterson mentioned by the author in the last Nautilus (55: 2, page 45) contained remnants of the animal too badly decomposed to be of use. Very recently, however, a living specimen, believed to be the first recorded, was dredged from 80 feet of water o[illegible] Fisher Island, Dade County, Florida. It was collected November 8 [illegible]y Mr. and Mrs. John Wentworth, to whom the author is much indebted for the privilege of examining the soft parts. The specimen was examined in the Zoology Laboratory of the University of Miami. Thanks are also due to Dr. F. G. Walton Smith of the Department of Zoology.

The shell of the living specimen, 49 mm. in length, conforms in all respects to the previous descriptions of the species. The shell is decidedly volutid in appearance, so much so that Dr. Gould referred to it as *Scaphella*.[1] Tryon said of it: "Its characters are intermediate between *Mitra* and *Voluta*. My figure is from Gould's type, and I can add nothing to the above meager information concerning this curious form."[2] Tryon also described and illustrated[3] *Mitra fergusoni* Sowerby, which appears to be nothing more than a worn specimen of *Mitra florida*. For the convenience of those to whom it is not readily available, I here quote A. A. Gould's description of this mollusk:

Mitra (*Scaphella*) florida. T. ovato-fusiformis, solidula, albida, ferrugineo nubeculata et lineis numerosis fuscis interruptis interdum albo articulatis cincta, quoad rostrum plicata et oblique lirata; anfractibus 7 + ultimo spiram ter excedente, antice angustato: apertura angusta, postice acuta; labro acuto: columella sexplicata, plica postrema proximam bis superante; intus alba.[4]

[1] A. A. Gould, *Otia Conchologica*, page 221.

[2] Tryon, G. W., *Manual of Conchology*, iv, page 116, plate 34, fig. 35.

[3] *Ibid.*, plate 34, fig. 32.

[4] A. A. Gould, *Otia Conchologica*, page 221.

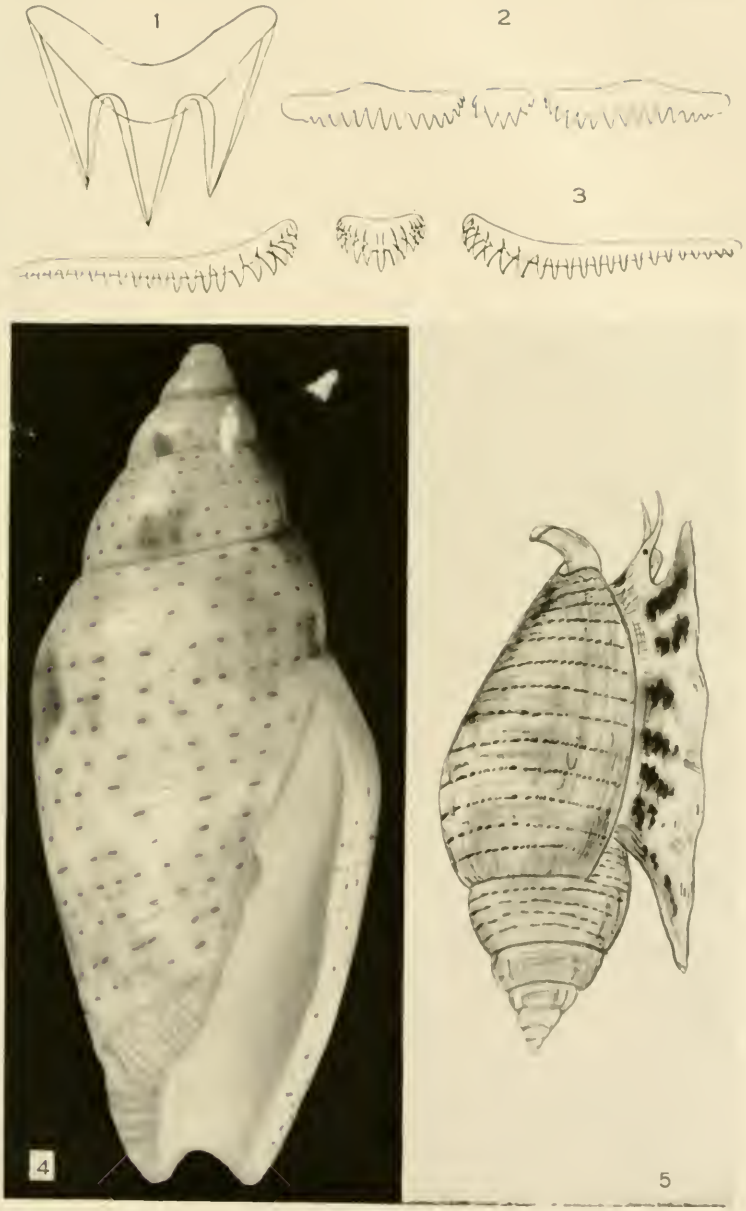

Fig. 1, tooth of *Volata scapha* Gmel. (after Tryon). Fig. 2, teeth of *Mitra cornea* Lam. (after Tryon). Fig. 3, teeth of *Mitra florida*. Figs. 4, 5, *Mitra florida*, enlarged.

The difficulties arising as a result of the shell characters may be readily appreciated. A typical volute is solid, ovate to fusiform, with a moderately produced spire and a large papillary nucleus. Its columella is plicate, the outer lip reinforced but remaining sharp. The shoulder may be smooth, angulate, nodose, or spinose. Typical dentition consists of a single multicuspid rachidian, with a general formula 0 : 1 : 0. See figure 1.

On the other hand, a typical *Mitra* is heavy, thick and fusiform, with a produced spire and small non-papillary nucleus. The aperture is narrow, the outer lip sharp; columella plicate, largest plication posteriorly located.[5] Typical *Mitra* dentition has the general formula 1 : 1 : 1, with the teeth multicuspid. See Pl. 7, f. 2 and 3. A transitional stage appears in *Volutomitra,* which is retained in the Mitridae by some authors, Volutidae by others.

The radula of the specimen under examination shows the multicuspid 1 : 1 : 1 formula. This is typical of *Mitra.* See fig. 3.

The animal, when the drawing (Plate 7, fig. 5) was made two days after its capture, was very timid, and crawled about little. However, Mrs. Wentworth said that it had previously been very active, especially after fresh sea-water was added. The head is small, the tentacles short and slender, bearing small black eyes a short distance out from their bases. The body is milky white, with blotches and cloudings of rich brown irregularly scattered here and there over its sides. The tentacles, head, proboscis and siphon are white with very pale cloudings of brown. The sole of the foot is finely spotted with brown in a pattern similar to that on the shell.

Mr. Patterson's specimen, illustrated on Plate 7, fig. 4, was recorded from wreckage raised from ten fathoms off the south end of Carysfort Reef. It is the largest specimen that has come to the author's attention, but it has unfortunately lost part of the protoconch.[6] Dall reports the species as taken by a collector of the United States National Museum on the Swan Islands in the Caribbean between Cuba and Honduras,[7] and as *Mitra fergusoni* it has been recorded from Panama. It has also been col-

[5] G. W. Tryon, Jr., *Manual of Conchology,* iv, page 106.

[6] Ted Bayer, *Notes on Florida Mollusca* in NAUTILUS 55: 2, page 45.

[7] W. H. Dall, Letter in the Conchologists' Exchange 2: 1, page 9.

lected from the Dry Tortugas. Henderson reported it from Loue Key, near Key West,[8] and Patterson records it from Carysfort Reef. The range, then, of *Mitra florida* seems to be from Miami, Florida, to Panama, if the record for *Mitra fergusoni* is not erroneous.

The characters of the newly examined radula thus place this lovely species without doubt in the genus *Mitra,* and the uncertainty as to its position is finally removed.

OBSERVATIONS ON THE FEEDING OF *AEOLIDIA PAPILLOSA* L., WITH NOTES ON THE HATCHING OF THE VELIGERS OF *CUTHONA AMOENA* A. & H.

BY HENRY D. RUSSELL

At 10:35 A.M. on December 9, 1937, a sea anemone (*Metridium marginatum* Oken) ⅛ in. in diameter was placed in a finger bowl with an *Aeolidia papillosa* L. 1½ in. long. Twice at this time the oral tentacles of the nudibranch touched the column of the anemone. Then with cerata characteristically bristling when initiating an attack, the mollusk opened the mouth, swelled the lips and completely enveloped the anemone. The prey was alternately drawn into and slightly extruded from the mouth. Each time it was drawn in, it was extruded less and less until after 22 minutes it was only visible as a dark mass within the mouth of the nudibranch. One minute later a small part of the prey appeared as continuous tissue. After six more minutes a brown fluid, presumably the macerated parts of the anemone appeared for a moment and were then quickly sucked back into the mouth. During the process of feeding the lips remained in a bloated condition and only returned to their normal size at 11:06 A.M. when the animal started crawling about the dish with no sign of the anemone in its mouth. During the attack, a few nematocysts bearing acontia were thrown out by the anemone, but these were sucked into the mouth of the nudibranch. No

[8] J. B. Henderson, Jr., Extracts from log of the *Eolis*, NAUTILUS 25: 6, page 71.

nematocysts were observed to explode. The total time of feeding was 31 minutes.

In the case of nudibranchs feeding upon larger *Metridium* the author has observed that the base of the anemone is attacked first. A great quantity of mucous is extruded about the fore parts of the mollusk and in it are caught many of the acontia of the anemone. The author has never noted that the nematocysts of acontia thus caught were exploded. Eventually many of these and much of the mucous is eaten by the mollusk along with parts or all of the anemone itself.

The rate, amount eaten and length of time involved, will prove of interest here and experiments concerned with this are cited below. Both the nudibranch and the anemone were dried with paper towels before and after the feeding to rid them of excess water and weighed at the same time.

An *Acolidia papillosa* $1\frac{1}{2} \times \frac{1}{2}$ in. weighing 1.88 grams ate .68 grams of a sea anemone (*Metridium marginatum*) weighing 4.02 grams in 10 hours.

Another *A. papillosa* $1\frac{3}{4} \times \frac{1}{2}$ inches weighing 2.03 grams ate .40 grams of a *M. marginatum* weighing .50 grams in $10\frac{3}{4}$ hours.

It appears from these results that there is a considerable difference in the rate of feeding and of the amount eaten among animals of almost the same size.

Hatching of the Veligers of *Cuthona amoena* Ald. & Hanc. On December 14, 1937, while the author was observing an egg capsule of *Cuthona amoena* that was attached to the main stalk of the hydroid *Obelia commissuralis* McCrady, the veligers contained in the capsule started to break out as noted below. The temperature of the surrounding sea water was 45° F. One veliger continually worked the cilia of the labial palps against the gelatinous wall of the capsule in one place while the others swam about within the capsule. Suddenly the wall yielded to the scratching action of the cilia and as if under the influence of pressure from within the capsule the veliger was forced into the hole with its anterior end slightly protruding into the surrounding sea water. Several times it contracted into its shell only to emerge again and furiously beat the cilia. During this performance the other veligers were swimming about and occasionally

colliding with the one that had broken through the capsular wall. Each collision forced it out a little farther into the sea water until after three or four such contacts it burst out of the capsule and swam about freely. The veliger was literally hurled from the capsule as if forced out by some internal pressure. As soon as the first one left, a second took its place in the opening and was blown or forced out into the surrounding sea water. The internal pressure within the capsule seemed to grow weaker as each veliger left the capsule until finally only one remained swimming about inside. No substance was observed to be extruded from the capsule with the veligers. It is entirely possible that osmotic pressure increases within the capsule as the veligers develop and that this is the force that propels them through the opening in the capsular wall and into the surrounding sea water.

THE AMERICAN SPECIES OF *VIVIPARUS*

By CALVIN GOODRICH

Mr. T. Van Hyning of the Florida State Museum has recently submitted an accumulation of Floridian *Viviparus* for comparison with examples of the genus in the Bryant Walker Collection. It was made clear very quickly that a good deal of basic information had first to be acquired. So all the available material having its source within the United States was examined, shell by shell. The literature on the subject was read. The geographical distribution of the several species was brought into such order as was possible. Since the study developed facts which appear not to have been published, or if so in scattered form and perfunctorily, I am venturing to set forth the findings.

The genus *Viviparus* illustrates what may be a natural law governing molluscan nomenclature, namely, that the more simple the shells of a group may be, the fewer and the least definite its characters and the more difficult to describe lucidly, then the heavier burden of specific names the group is compelled to carry. In this matter, *Viviparus* lags a great way behind Pleuroceridae or perhaps the French Anodontinae, but it is probably abreast of some of the genera of Zonitidae and even with the currently expanding *Cerion*. Reeve recognized about seventy species of

Paludina which in his day was an Island of Crete on which species parachuted in flocks. It included *Viviparus, Campeloma, Tulotoma, Lioplax* and other genera that now are differentiated one from another. Kobelt undertook to treat of *Viviparus* alone, but left the American forms under *Paludina.* Notwithstanding limitations he established, his species and subspecies of *Viviparus* ran to 259. On the assumption that anything geologically old must be extinct, American paleontology has devised about thirty names, permitting only *V. georgianus* of the Florida Pliocene to survive into recent times. There have been additions since Kobelt, some cleaving and splitting, but hardly any recognition of the truth that *Viviparus,* like most fresh water mollusks, is inconstant of shape and pigmentation.

Generic characters, the same as specific characters, are variable. Embryo shells of western forms that have been seen are thin, whitish, transparent, but in specimens of a Florida form that Van Hyning sent which contained the animal parts the embryos ranged in color from yellowish white just after development from the egg to dark brown when the shell is ready for discharge. The young shell is so much broader than high that Say (1829) did not recognize it as merely a juvenile and gave that of *V. intertextus* the name of *Paludina transversa.*

The embryo has from two or three to a dozen or more lines of epidermal striations, raised into very fine hairs. In the uncleaned lot of Van Hyning shells were numbers of adults which retained the lirations, but as any ordinary brushing will remove the bristles such examples are probably very rare in collections. Binney (1865) in Fig. 54 has illustrated a shell of the kind, and Say in his description of *intertextus* noted that his specimens had "minute, very numerous, obsolete revolving, deciduous lines." In the instance of Reeve's *Paludina ciliata,* of Siam, the raised parts of the lines are, as Reeve put it, "eye-lashed." Wetherby (1876) found that *Tulotoma coosaensis* had a "coating of long spines or hairs, arranged in spiral rows around the whorls." Probably no cabinet specimen of *coosaensis* still has these "spines." So what is not simply a generic character, but also a family one, may be so evanescent as to escape general attention.

The periphery of the embryo is rounded, roundly angled or

sharply angled; in *V. viviparus* it is said to be carinate. Possibly mechanical pressure in the marsupium determines the form of the keel. As growth proceeds, the shell alters its configuration rapidly from broad and depressed to conic or globose. The adult shell of American *Viviparus* is commonly short-spired. It has a large body whorl, a correspondingly large aperture and four equidistant bands of pigment, where banding exists, that are occasionally decreased or increased in number. The whorls do not, seemingly, exceed six or six and a half, although the count in some foreign species runs to seven. The green ground color usually mentioned in descriptions fades in old specimens to brown or dark yellow and, bleached by sun and rain on lake beaches, this may become almost white. The oldest individuals of a Georgia lot were black as were shells of about three whorls which came from the Santa Fe River of Florida. Mr. Van Hyning directed my attention to the fact that lake forms of the southeast are "much smaller than the ones from the rivers." Specimens of *contectoides* from two lakes of Indiana are of about the same size as material from Indiana streams. The operculum does not appear to vary as between species. It is thin, concentric, showing many rests or pauses, the later ones rougher than the earlier ones.

Viviparus contectoides Binney, 1865. The mollusk is from five to six whorls in size, ordinarily thin, deeply sutured. The four bands when present are usually well marked, conspicuous. The umbilical perforation is a mere chink or is entirely covered over by the columellar fold. Three embryos have an index of obesity averaging 107.1, showing the excess of diameter over altitude in the very young. Four shells from a lake of Putnam County, Illinois, lacking about a whorl of maturity, have an obesity index of 95.2. Because of the common erosion of apices in adults, comparison of diameter with altitude in such specimens could be made only by measuring the height of the last three whorls. The range of indexes of thirteen lots, measured in this way, is from 85.3 to 89.9. This can scarcely be thought a wide variation in degree of globosity, but in general appearance there is considerable variation as between colonies of different localities. It has been noticeable at the same time that members of a given colony of the genus are very much alike. In other words, approach to

equilibrium is reached in each locality, and this applies to form, proportions, pigmentation of epidermis and banding.

Van Cleave and Richey (1936) noted that the medians of the radula of this species have commonly 5–1–5 denticles, with a range of 4–6—1—6–4. This is a lower average denticle count than was found in other species the radulae of which were studied.

The distribution of *contectoides* is from New York to West Florida, South Carolina to Arkansas (F. C. Baker, 1928). The Binney citation (1865) from Michigan may be ignored.

Viviparus contectoides impolitus Pilsbry, 1916. The shell is described as "rough, with irregular growth lines, often somewhat malleated." As these are external characters, the mollusk might, simply on these points, be dismissed as an ecological form. Yet it occurs in several localities of an area of North Alabama which has a number of molluscan oddities and might very well have developed specialized anatomical characteristics correlated with those of the exterior, all through prolonged existence in springs and spring branches. The ratio of diameter to altitude in *impolitus* is about the same as in typical *contectoides*. The last whorl is strongly shouldered and in some specimens its slope does not form a continuous line with the earlier whorls.

Viviparus contectoides goodrichi Archer, 1933. The index of obesity is from 80.1 to 84.8. That is, it has a greater average altitude compared with diameter than *contectoides* has. Of seventy specimens, thirty-seven, or 52.8 per cent, were wanting the revolving color bands. The shell is the common *Viviparus* of Chipola River, western Florida, some of its tributaries and the neighboring Choctawhatches River. Shortly after the subspecies was named, Mr. O. C. Van Hyning sent me examples of all the mollusca of the type stream. It was noticeable that the surface occupants were all larger than was common to their species whereas the bottom inhabitants were of normal size. It seemed at the time reasonable to conclude that the surface of the stream was carrying more food than were lower waters, and that this richness was reflected in the greater growth of the top dwellers. Such a reaction has been observed elsewhere. However, *goodrichi* is distributed over a fairly wide area and has there retained its peculiarities, and short of further study or experiment should be considered a distinct race.

Viviparus contectoides form *limi* (Pilsbry), 1918, replacing *V. contectoides compactus* Pilsbry, 1916, preoccupied. The shell is dwarfed, somewhat compressed, imperforate. It has been taken at widely separated localities in Georgia and Florida. It appears to be an ecological form that might turn up anywhere within the area of distribution of *contectoides*.

Viviparus troostianus (Lea), 1844. I am following Call (1894) as to the identity of this species. In shape, this shell is very much like *contectoides,* but of about half its size. Also like it, it has four clearly defined bands. It resembles *intertextus* of northern waters in being umbilicated. It is known to occur in Stone's and Harpeth rivers of the Cumberland River in Tennessee; Spring Creek, the discharge of the big spring at Tuscumbia, Colbert County, Alabama, emptying into the Tennessee River. Such shells that have been seen are uniform of configuration, umbilication and color.

Viviparus intertextus (Say), 1829. The nine embryos that have been examined differ from those of *contectoides* in being more depressed, and this bears a relationship with the adult form of the species which is low-spired, decidedly globose. The full measurements of one Louisiana specimen is 25.50 mm. altitude, 25.50 mm. diameter, of a Mobile, Alabama, example, 26 mm. by 26 mm. Southern specimens, measured as were *contectoides,* have an obesity index of 95.3. The shells seen are dark, thin, large of aperture; the whorls shouldered. The greatest number of whorls is five. There are no color bands. The umbilicus is closed in all available for examination save two or three specimens. This form has been taken as far north as Henry County, Missouri.

Viviparus intertextus illinoisensis F. C. Baker, 1928. The subspecies was erected mainly upon its being umbilicate in the majority of instances. All shells seen that came from north of the Ohio River fall within the description. Of sixteen specimens from woods pools near Reelfoot Lake, west Tennessee, nine could be called *illinoisensis,* the others more truly *intertextus.* Material from the Illinois River has an obesity index of 107.5, that from White Bear Lake, Minnesota, 95.7. The number of whorls of the subspecies does not seem to exceed four and a half. Banding is

in course of obsoleseence. There are indefinite indications that small stream forms of this shell are of higher spire than those of larger streams. *Illinoisensis* occurs in the Upper Mississippi River, in Wisconsin and Illinois, and in the drainage of the Wabash River in Indiana. Perhaps certain lots from Kentucky belong here.

Viviparus subpurpureus (Say), 1829. The species is of two forms, one markedly conic, the other in which the body whorl is nearly as ventricose as is that of *intertextus*. The index of obesity of the conic form is 77.6 to 86.2; of the more globose aspect, 86.0 to 90.6. So far as may be assumed from specimens at hand, the globose form is of the larger streams, the Mississippi, Ohio and Wabash rivers. The full measurements of the two largest shells seen are:

Big Creek, Posey County, Indiana, six whorls Alt. 35.50, dia. 23.75.

Wabash River, New Harmony, Indiana, five and a half whorls: Alt. 30, dia. 24 mm.

The whorls are more flattened than in other species, the aperture of smaller relative size. The spire of the embryo is somewhat elevated. F. C. Baker (1928) directs attention to the odd bulging of the penultimate whorl, plainest when the aperture is turned away from the observer. In a few lots, the shells of which seemed depauperate, this characteristic was absent. The purplish tinge noted by Say has faded in cabinet examples. As in *intertextus,* banding is in course of disappearance. The umbilicus is usually covered by the columellar fold, but in occasional specimens a small chink is left.

Viviparus subpurpureus texanus (Tryon), 1862. F. C. Baker (1928) has resurrected this mollusk from the synonymy on the strength of its being "a much narrower shell which occurs from Missouri to Texas, Louisiana and Mississippi." Unless the following form is *texanus* I have seen no specimens of it.

Viviparus subpurpureus form *halcanus* (Lea), 1847. Lea says of his mollusks that they show "a disposition in most of the specimens to a compression below the sutures," which may be condensed to "flat-whorled." This is characteristic of shells from Caddo Lake, Louisiana, and Texas, all of which are small,

rather thin and without revolving bands. The index of obesity is 85.4 which is within the range of the northern conic forms of typical *subpurpureus*. One shell alone of those observed had the swollen penultimate whorl. At best, I believe, *haleanus* is only a variant. Call's opinion of it (1894) may be gathered from the fact that he cites typical *subpurpureus* from Caddo Lake, and ignores the name *haleanus*.

Viviparus georgianus (Lea), 1937. The Lea specimens were assigned to Darien, Georgia, a place-name that among naturalists of the early nineteenth century loosely included the Altamaha River and its bayous, St. Simon Island and probably even Sidney Lanier's "Marshes of Glynn." *V. waltonii* Tryon of St. John's River, Florida, is virtually identical with the Lea shells, as is also his varietal *fasciatus*. The species, inclusive of its several forms, is large or small, thick or of nearly paper thinness, conic or globose, banded or without bands, the whorls decidedly convex or somewhat flattened—greatly varied as between colonies, but little so within them. In a circumscribed area of the Lake George region, specimens from Hitchen's Creek have the conic configuration which Pilsbry named *altior*, shells from Juniper Creek take the globose form to which the name *walkeri* has been given, and at least one locality has shells corresponding to the depauperate *warcanus*.

The obesity indexes of *georgianus* of what can be termed the usual or common St. John's River phase are from 79.8, Lake Okeechobee, to 86.1, Lake Teala Apopka, but most of the Van Hyning lots are in the narrower range of 84 to 86.

The umbilicus is covered with the columellar fold in most instances. Of fifteen lots of the Van Hyning collection, seven have dark revolving bands in an epidermal ground color only slightly lighter; five have the same dark bands contrasting with a ground color of yellow or yellowish-brown, and three are yellowish, the bands so faded that it would seem the pigment glands lacked material for proper secretion. In several of the lots are individuals entirely without bands, the epidermis approaching albinism.

A curious form is a light-colored race from the Suwanee River at Fannin Springs, Levy County, Florida. Van Hyning's label

records that it was "found clinging to the under side of rocks." Thirty-two per cent of 76 specimens have color bands, none of them conspicuous. Rest marks make contrasting black axial lines against a whitish-yellow ground color. Sixteen distinct varices were counted in one shell. The obesity index of the seventeen largest specimens is 83.6, which is that of typical *georgianus*. Another lot, labelled as from the same locality, has an index of 88.3, and resembles the form *walkeri*. It would appear that within a short reach of the Suwanee River are differing ecological conditions reacting differently on the same mollusean species.

The center of population of *georgianus* is eastern and central Florida. Binney reports the species as occurring in South Carolina. *Vivipara haldemaniana* "Shuttleworth," Frauenfeld, 1862, type locality, Black Creek, Florida, is probably identical with *georgianus*, 1837.

Viviparus georgianus form *altior* (Pilsbry), 1892. The original lot was from an Indian refuse heap. The five or six whorls are loosely coiled, a little flattened. The oldest specimens have the distorted body whorl which, at least in the Pleuroceridae and probably so in *Viviparus*, is a symptom of senility. Dall (1892) spoke of others of this same finding as "remarkable malformations," and said they were "due without doubt to the direct physiological action of some obnoxious substance, such as salt, sulphur, etc., in the water in which they lived." The "obnoxious substance" may quite as likely have developed in the organisms themselves just as diseases of old age do in mammals. Inasmuch as some of the individuals taken from the kitchen midden are neither distorted nor malformed there seems no sound reason for discarding *altior* altogether although, considering its close geographical connection with more typical *georgianus*, it does, to all seeming, belong to a category of less importance than subspecies. The average obesity index of twelve specimens is 77.1, showing that in spite of a body whorl of large diameter, the altitude is unusually high. Bands may be seen by transmitted light. Shells resembling *altior* are in the Walker collection from Lake Monroe and Jessup, Orange County, Florida, and in Mr. Van Hyning's from Lake Ashley, Volusia County.

Viviparus georgianus form *limnothauma* (Pilsbry), 1895. The

whorls of the types are "much swollen around the upper part, sloping below, giving a shouldered appearance." The shells were found in the same refuse pile as *altior*. Pilsbry reported that others were collected living in Lake George.

Viviparus georgianus form *walkeri* (Pilsbry and Johnson), 1912. This is a globose form corresponding to *V. intertextus* of the Mississippi Valley, but more closely related to *georgianus* than *intertextus* is to any other species of its region. Paratypes are thin, rather rough, the bands almost merging into the dark ground color. The obesity index of ten topotypes averages 95.2. Other lots nearly as globose are from Ocklawha River, Marion County, and a branch of Peace River, Polk County, Florida. With some hesitancy, larger and heavier shells of the Suwannee drainage, of which Sante Fe and New rivers are a part, are placed under *walkeri,* and this mainly on the ratio of diameter to height. A still larger, thicker, more shouldered *Viviparus* occupies Silver Springs, Marion County. Two separate lots of fifteen shells each gave an average index of obesity of 89.7 and 90.9. The full measurements of five Silver Springs shells of the Van Hyning collection averaged 27.75 mm. altitude, 24.50 mm. diameter. Out of forty-nine specimens examined, twenty-two have the usual four bands; ten have lost one of these bands; six have lost two, and eleven are without bands.

Viviparus georgianus form *wareanus* (Shuttleworth), 1852. The shells, taken in Lake Ware, East Florida, reached Shuttleworth through Rugel, and Rugel gave specimens to Mrs. Andrews, whose collection came into the possession of Bryant Walker. These mollusks are thin, brownish, without bands; the umbilicus is merely a chink. The index of obesity is 85.7, which is close to that of *georgianus* of Lake Okeechobee. Similar forms are from Reedy Lake, Polk County; parts of Lake George and a place named Upson that is not listed in the United States Postal Guide. The only material in the Van Hyning lots that might be called *wareanus* is from Wauberg Lake, Alachua County, Florida. The mollusk in my opinion is a depauperate one.

The position of the following is uncertain:

Blue Creek, Early County, and Oseewichee Springs, south of Abbeville, Wilcox County, Georgia. The specimens are rather

large for southeastern *Viviparus*. They are heavy, shouldered; the aperture is more ovate than circular. The body whorl is a little flattened. Whorls, five and a half. Each shell has four well-marked color bands. The two lots have characteristics both of *contectoides* and *georgianus*. It may be of significance that they are on, or near, the dividing line between those two species.

Lake Waccamaw, Columbus County, North Carolina. Twenty-two specimens. Umbilicus covered except in seven in which the columellar fold does not completely extend over the opening. Obesity index, 97. No bands. The shells have been called *V. intertextus*, but their location is so far east of the range of that species and so much nearer to the area of *georgianus* that it seems probable the mollusks have an affinity with Florida forms more than, superficially, they appear to have.

Blue Springs Run, 3 miles east of Marianna, Jackson County, Florida. Not greatly different in shape from the St. John's River forms. The ground color corresponds to the Danube Green of Ridgway's "Color Standards." Counting capillary lines with bands, one specimen has eight of these revolving pigmentations. Through coalescence of bands, one shell has three, one only two. There is, besides, the common four-band formula. The colony is outside the region that may be termed *georgianus'* and in that of *contectoides goodrichi*.

On the bases of information available, it can be said that *Viviparus* of the United States has a fairly symmetrical geographical pattern. The one serious flaw in it is that isolated occurrence of the genus in North Carolina, and this defect or imperfection may in time be removed by a more thorough understanding of specific relationships.

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OLIVELLA PYCNA

BY D. S. AND E. W. GIFFORD

On July 9, 1941, we collected seven living examples of *Olivella pycna*[1] on the beach at Cresent City, Del Norte County, California. The following day we took another at Port Orford, Curry County, Oregon, but failed on the 11th to find any at Trinidad Head, Humboldt County, California.

The University of California Museum of Anthropology possesses 885 archeological examples of this species from various ancient Indian mounds in Central California, as follows: from Kern County, 1; from the Delta region of San Joaquin, Sacramento, and Contra Costa Counties, 647; from Napa County, 1; from San Francisco Bay shores (Alameda and Santa Clara Counties), 229; from the shores of Drake's Bay and Tomales Bay, Marin County, 7.

Bolinas, Marin County, is the type locality for *Olivella pycna*. There it was dredged from 3 to 4 fathoms depth. Mr. Allyn G. Smith, who kindly checked our identification, has a series dredged near Hog Island, Tomales Bay, from a depth of 5 fathoms. The University of California Department of Zoology has several taken littorally in Tomales Bay. Messrs. Tom and John Q. Burch have kindly supplied us with littoral specimens from Morro Bay, San

[1] S. Stillman Berry, An Undescribed Californian Olivella, Proc. Malacological Society of London, vol. 21, pp. 262–265, 1935.

Luis Obispo County. It seems unlikely that the Indians dredged their specimens. Perhaps beach worn specimens and additional littoral collecting grounds not yet found by conchologists were their sources of supply. Except for the seven specimens from Marin County mounds, all are from mounds far removed from the habitat of the species. Either they were traded inland by coastal Indians or excursions were made to the coast by inhabitants of the interior.

In northwestern California *Olivella pycna* is fairly common in Indian necklaces, dress fringes, etc. Among examples in the University of California Museum of Anthropology are 1–1505 (necklace) from the Hupa Indians, and 1–2334 (fringed buckskin dress) from the Yurok, Karok, or Hupa Indians. *Olivella pycna* is usually used along with young *Olivella biplicata* of about the same size. Stearns describes a string of "probably over a thousand shells"[2] of *Olivella biplicata* and *Olivella intorta* from the Hupa Indians of Humboldt County. His so-called *intorta* is probably *pycna*. No doubt the beach at Cresent City was one source of supply of both species for the modern Indians.

Dr. S. Stillman Berry has checked our identification to the extent of asserting that ten archeological specimens from Santa Clara County and one live-collected shell from Crescent City sent to him "are *Olivella pycna* without any reasonable doubt."

FIRST RECORD OF *BARTLETTIA* IN PARAGUAY

By ALBERTO CARCELLES
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The single species in the genus *Bartlettia* is *B. stefanensis* Moricand, from the Huallaga River, affluent of the Amazonas, in Ecuador. Dr. F. H. Schade sent to the Museo Argentino de Sciencias Naturales, twelve specimens collected in Arroyo Guazu, Paraguay.

Bartlettia lives in the waterfalls, incrusted in hard rocks ("tosca").

[2] Robert E. C. Stearns, Ethno-Conchology—A Study of Primitive Money, Report of the U. S. National Museum for the Year ending June 30, 1887, p. 326, 1889.

The family Aetheriidae consists of three genera: *Aetheria* Lam. from the Nile River with species in the Pleistocene of West Africa, a genus which resembles *Ostrea*, but with two adductors; *Acostea* D'Orb. of the Magdalena River, Colombia, also similar to *Ostrea* with one adductor; and *Bartlettia* Adams, from a tributary of the Amazonas, possessing two adductors, the anterior of which is the longer. The anterior area extends into the water, and the posterior area is hidden between the stones, resembling superficially *Anodontites tenebricosus*. In the opinion of Ihering, the fauna of the Paraguay River is related to that of the Amazonas, notably in the presence of Unionacea and fishes. The presence of *B. stefanensis* in Paraguay favors this thesis.

The shell is very irregular, subcircular, with the anterior area longer, twisted, and compressed, the posterior area broad, rounded, with the umbo-ventral zone straight, without hinge, the amphidetic ligament short, thick, and subinternal. The superior and inferior margins of the anterior zones are convergent, forming a little channel. The outer surface is irregular, resembling the bark of a tree, and is most irregular on the area of the shell exposed to erosion. External color greenish olive, inside greenish blue, and somewhat iridescent. The shell is free when young and adherent in the adult stage, the torsion being characteristic of the adult stage.

Measurements: a–p 10, u–v 5, thickness 2.5 mm. (youngest specimens, similar to *Anodontites tenebricosus*). A–p 81.4, u–v 38.5, thickness 32.2 mm. (adult stage), no. 19961, M.A.C.N.

This is the first record of *Bartlettia* in the drainage system of the Paraguay-Parana Rivers.

PINE WOODS AS ADEQUATE HABITAT TYPES FOR LAND MOLLUSCA

By ALLAN F. ARCHER

Although comparatively little has been written on the subject of land mollusks in pine woods, what little we have in print testifies for the most part to the scarcity or absence of molluscan life in coniferous cover. It is gratifying to note the recent appearance of Henry van der Schalie's paper, "Larger Land Shells

from Pine Woods in Northern Michigan," Mich. Acad. Sci., Arts, and Letters, 1939, Vol. 25.

After some years of collecting in pine woods and the taking of field data in an area extending from New England to Texas I am convinced of the errors in the statement that such cover is quite barren of molluscan life. Even though poorly decomposed pine logs are apt to be barren of mollusks, the pine straw and other debris certainly harbor them. Charred pine wood furnishes adequate food and shelter for snails and slugs. It must, of course, be admitted that the lack of diversity of habitats, the poorer quality of available mineral salts, and the greater scarcity of plant foods render pines less favorable than hardwoods for a large variety of species of Mollusca and soil Arthropoda.

The field collector who tackles pine woods needs to bear in mind the past history of the locality that he investigates as well as the interplay between factors which operate on the animal life. He must view the locality with the critical eye of the ecologist. In the southern United States natural, pure stands of pine are rather uncommon, and many pine plots belong to an early stage of reforestation on formerly cultivated land. These latter can only be classified as old-field pine, which grows on eroded soil impoverished by years of soil-depleting cotton crops. Fire factors and overgrazing exert very depressing effects on pine cover that would otherwise harbor normal molluscan life. Collecting in pine woods is sometimes hard work, and should be undertaken whenever possible during wet seasons.

The nearest to complete barrenness that I have ever observed is to be found in pine timber on chert or indurated Coastal Plain soils (Jefferson and Autauga Counties, Alabama) where repeated fires have destroyed all humus, leaving neither food nor shelter for mollusks or soil arthropods. Even on poor, acidic soils in New England I have found pine straw inhabited by a fair amount of small Zonitidae and Endodontidae together with an occasional polygyrid. Pine woods in the southern states may be classified according to a genetic system: 1. Natural pine-forest types on calcareous soils. 2. Natural pine-forest types on non-calcarous soils. 3. Old-field pine. Item 1 is relatively scarce, in fact less than one per cent of the total area. Item 2 is widely

scattered, and occupies nearly every type of land form, but does not occupy a large total area. In mountainous country it is of negligible importance in comparison with the oak-pine type. Neither 1 nor 2 can be considered as representing the theoretical climax forest, but both are certainly influenced and maintained by edaphic factors. Item 3 has a very wide distribution, but never occupies any large single blocks of territory.

In the above connection Dr. van der Schalie quotes Dr. Fernald's view that jack pine is invariably associated with acid soils. While I am not prepared to contradict this, I believe that more evidence for or against this should be forthcoming from northern Michigan where some of the soils of the pine-woods region are not distinctly acid. In the southern United States most pines except those in swamps and savannas can and do grow on calcareous soils. From Virginia to Florida and Central America pines are known to grow not merely on calcareous soils but even on bare limestone. Pines of a number of species grow on dry soils regardless of their pH (within normal biological limits), especially if they do not suffer from competition with hardwood species.

Large land snails are quite as apt to be present in pine types on non-calcareous soil as on calcareous soil. In general, however, the rather small and the very small species predominate in pine communities. The following paragraphs will serve as illustrations of some typical pine-woods mollusk faunas of the lower South. All cited below will pertain to the "less favorable" non-calcareous soils.

A. *Piedmont Province.* Non-calcareous soils, although not necessarily deficient in mineral salts. 1. Old peneplain country now exhibiting juvenile land forms. Opelika, Lee County, Alabama. Pine woods of the old-field type, or else modified by fires. Cover: *Pinus echinata, P. taeda,* 3 species of young oaks, *Nyssa sylvatica, Rhus copallina, Smilax pumila.* Mollusca: *Retinella indentata paucilirata, Zonitoides intertextus, Triodopsis fallax vannostrandi.* 2. Hatchet Creek, Coosa County, Alabama. Pines on summits of sloping interfluves. The ground is rather rocky. Cover: *Pinus taeda, P. echinata, Hydrangea quercifolia, Smilax* sp., ferns. Mollusca: *Philomycus carolinianus, Haplotrema concavum, Gastrodonta interna, Zonitoides arboreus, Stenotrema*

barbigerum, S. stenotrema, Triodopsis tridentata, Mesodon inflectus, M. perigraptus.

B. *Coastal Plain Province.* The longleaf-pine woods occur on some of our poorest soils. Bon Secour, Baldwin County, Alabama. Cover: *Pinus palustris, Serenoa serrulata,* and a dense, high undergrowth of grasses. Mollusca: *Retinella indentata paucilirata, Polygyra auriformis, Praticolella mobiliana.*

C. *Appalachian Plateaus.* Uplands of low relief on sandstone. Black Warrior National Forest, Winston County, Alabama. The Pine cover is certainly of the old-field type. Cover: *Pinus echinata, Sassafras variifolium,* 5 species of young oaks, *Morongia uncinata, Potentilla, Antennaria plantaginifolia,* and some grasses. Mollusca: *Philomycus carolinianus, Gastrodonta interna, Zonitoides intertextus, Z. arboreus, Stenotrema barbigerum, Triodopsis tridentata, Mesodon perigraptus, M. thyroidus.*

D. Pine straw samples from central Butler County, Alabama, yield the following small snails: *Zonitoides elliotti, Z. arboreus, Euconulus chersinus, Punctum minutissimum, Strobilops labyrinthica.*

In those localities in which more than three species are cited some fairly large snails occur even though the soils are non-calcareous. Even where the species found amount to only three, we are apt to find one of them to be common as to individuals. In the list of eight species from Winston County four of them are fairly common. I can state that the above localities are not exceptional, but are typical illustrations of the adequateness of pine woods as molluscan habitats.

ZOÖGENETES HARPA (SAY) IN THE ROCKY MOUNTAINS

By PHIL L. MARSH

There has been some doubt about the inclusion of *Zoögenetes harpa* (Say) in the native molluscan fauna of the Rocky Mountains. Henderson did not mention it in his studies of "The Mollusca of Colorado, Utah, Montana, Idaho and Wyoming" (University of Colorado Studies, Vol. xiii, No. 2, Aug. 1924) but in his supplement (Vol. xxiii, No. 2, Jan. 1936), referring to his

report in the NAUTILUS (xliii, 104, 1930), he told of its discovery at Estes Park, Colo. He states in the supplement that "With it was *Carychium*, another genus not before reported from Colorado, which leads to a suspicion that after all both may have been introduced." Chamberlin and Jones do not include it in their "Catalogue of the Mollusca of Utah (University of Utah, Biological Series, Vol. 1, No. 1, June, 1929)"

In Aug., 1941, Mr. Calvin Goodrich and I collected one specimen of *Z. harpa* in Shoshone Canyon, 1 mile west of Elephant Head, Park Co., Wyo. (about 10 miles east of the East Gate of Yellowstone National Park), and two specimens on the hillside at the edge of Horseshoe Park, Rocky Mountain National Park, Colorado. The Colorado station is not far from Estes Park, but Shoshone Canyon is more than 300 miles distant.

Zoögenetes harpa seems to be as scarce in the Rocky Mountains as it is in northern Michigan. In the Drummond Island region of Michigan I have collected six specimens from five localities. During several summers I have taken tens of thousands of small snails from Arnold Island, in Whitney Bay of Drummond Island; I found only one example of *Z. harpa*. From some fifty stations in the surrounding area I have collected many times that number of small snails, including only half a dozen of *Z. harpa*. It is, perhaps, this scarcity of the species that accounts for the few western records.

It would seem safe to include *Zoögenetes harpa* (Say) in the native fauna of the Rocky Mountains.

FOOD HABITS OF *HAPLOTREMA MINIMUM* ANCEY AND HABITS OF ASSOCIATED MOLLUSKS ON THE MILLS COLLEGE CAMPUS

BY WILLIAM MARCUS INGRAM
Mills College, California

Three species of snails and one slug are associated with the carnivorous mollusk, *Haplotrema minimum* Ancey, on the Mills College campus. The common associates are *Helminthoglypta arrosa holderiana* Cooper and *Helminthoglypta diabloensis* (Cooper); the mollusks less commonly found in association with

H. minimum are the garden snail pest, *Helix aspersa* Müller, and the large slug, *Ariolimax columbianus* Gould.

The typical habitat of *H. minimum* is found beneath water-carried debris and eucalyptus branches and leaves on the banks of Leona creek. In such a habitat the ground is moist throughout all but the summer months. Occasionally, however, individuals have been taken from beneath eucalyptus bark away from the creek, where moisture conditions are less favorable.

H. minimum has been observed feeding on young and adults of *H. arrosa holderiana* and *H. diabloensis* in the field, and on the young of *H. aspersa* in the laboratory. Individuals confined to terraria with adults of *H. aspersa* and of *A. columbianus* have never been observed to feed upon these two typical herbivores through starvation periods of 90 days. Niether did they feed on one another during this interval.

Even though it is not common, because of a usual lack of food supply, to find large aggregates of carnivorous snails in one area 7 individuals of *H. minimum* have been taken together. These were collected in an area 2 by 4 feet from beneath eucalyptus leaf humus in crevices in the moist soil substratum. Three *H. arrosa holderiana* were collected with this carnivore aggregate. Three other *Haplotrema* were collected from moist eucalyptus leaves covered by eucalyptus bark. Three *H. diabloensis* adults and 6 young were also taken in this habitat.

Food Habits of Haplotrema.—Individuals of *Haplotrema* have been confined to terraria with all of the above species of land mollusks. The following pertinent data have been gathered concerning feeding activity.

In one terrarium 2 *Haplotrema* began feeding on a young *H. arrosa holderiana* 10 mm. in height. The 2 predators approached and made contact with the food snail simultaneously. The predators could be seen working their lips as they explored the shell. One then thrust its head into the aperture of the food snail and the other rasped an area of shell from the apical whorls. Twenty-five minutes were required for the completion of the feeding process. Occasionally during the feeding act a dark-colored portion of the prey was observed passing down the alimentary canals of the feeding snails.

The feeding activities were carried on beneath the rays of a 60 watt bulb placed a foot away from the terrarium. Activity carried on under such conditions probably indicates that this carnivore will feed at any time during the daylight hours. Twenty individuals have been observed in the field between the hours of from 1 to 4 P.M. actively crawling about under conditions of daylight. Many more have been gathered in an extended condition between the same hours.

Five *Haplotrema* were placed in a terrarium with 2 adult individuals of *H. aspersa*. Twenty-three minutes after the geotropic *Haplotrema* were placed in the terrarium one climbed to where the extended helices were at rest and moved its head over the posterior foot regions of the latter and then returned to the bottom of the terrarium. No feeding attempt was made, although the *Haplotrema* had been without food for a known 24 hours. These species were left together for 24 days, when they all went into aestivation.

This data possibly indicates that *H. minimum* does not relish adult *Helix*, although the carnivore has often been observed filing through the fragile shells and devouring the soft parts of immature individuals, 10–15 mm. in height of the latter species.

One observation indicates that *H. minimum* will attack but not eat larger individuals of *H. aspersa*. An immature snail 23 mm. in length was observed moving about at 9 : 30 A.M. Three inches above the floor of the terrarium this individual came in contact with a distended but inactive *H. minimum*. As the garden pest moved over the head of the carnivore the latter withdrew its tentacles. The *Helix* stopped its forward motion and for 2 minutes remained feeling about over the head of the *Haplotrema*. Suddenly the lips of the carnivore were noted to protrude against the ventral surface of the head of the *Helix*. The latter rapidly withdrew into its shell and dropped to the bottom of the terrarium. Here it remained inactive with the aperture turned upward for approximately 60 seconds and then righted itself and began moving about. On examination a gash 2 mm. in length and .25 mm. at the point of maximum width was observed on the ventral side of the head. The gash was roughly triangular in shape. The wound was obviously inflicted when

the *Haplotrema* made its sudden attack to rid itself of the prying *Helix*.

It is suggested here that individuals of *Haplotrema minimum* may serve as an effective control for the garden snail, *Helix aspersa*, in certain areas of the campus. It was shown above that although *Haplotrema* has not been observed feeding on adult garden snails, it does devour young ones. Extensive collecting in areas of the campus where *Haplotrema* abounds has not revealed garden snails even though environmental conditions are suitable for their abundance.

Habits of Associated Snails.—*Helminthoglypta arrosa holderiana* and *H. diablocnsis* are found in similar habitats on the Mills College campus. Individuals of these species have been most abundantly collected from beneath fallen eucalyptus tree bark and from beneath fixed but loose bark. They have been taken up as high as 3 feet on a eucalyptus trunk, although they are to be gathered in greater quantity beneath started bark at the base of these trees, where conditions of moisture are more favorable. The latter species is not uncommonly found beneath brush piles on the campus. Collecting data indicate that both species aestivate beneath eucalyptus bark during warm spells in May (Fahrenheit temperature 79–85 degrees). During foggy days following warm ones they break through the epiphragm and actively move about in search of food. Both species have also been taken from beneath water-carried debris on the banks of Leona creek. *H. arrosa holderiana* has been taken from eucalyptus "islands" in Redwood Park above the campus. In 4 instances isolated eucalyptus trees were examined and all yielded specimens. Since *H. arrosa holderiana* and *H. diablocnsis* have apparently become firmly established in an introduced habitat afforded by eucalyptus trees it would seem that these snails are very adaptable species. Pilsbry (1939) reports the habitat of *H. diablocnsis* sent to him by the eminent California land snail collector, Allyn G. Smith, as follows, "It is a snail of the foothills, frequently found in rock piles, but more often under logs, brush, or other deciduous cover. . . . It does not normally live near San Francisco Bay or the ocean."

Ariolimax columbianus is abundant along the banks of Leona

creek beneath ivy, where it has abundant moisture and good protection from the sun. The writer has collected individuals only singly. This snail is abundant in canyons behind the campus where the live oak, *Quercus agrifolia,* and poison-oak, *Rhus diversibola,* abound. Two individuals have been taken feeding on poison oak. This species has been collected crawling about during the daylight hours.

Thanks are due to Dr. G. Dallas Hanna and Mr. Allyn G. Smith of the California Academy of Sciences, San Francisco, for identifying some of the species discussed here. I wish to express my gratitude to my assistants and students of beginning zoology of the spring semester of 1941 for collecting snails from the campus.

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NOTES AND NEWS

MORE SINISTRAL GASTROPODS.—The note in the current NAUTILUS about a sinistral *Succinea* calls to mind instances of heterostrophy in other land snails which have recently come to my attention. The first of these is a specimen of *Polygyra cereolus* taken by my wife Ruth Ingersoll Baily at Hillsboro, Florida, in the spring of 1940. It is bleached white but otherwise in perfect condition. It is the form described by Dr. Pilsbry as having whorls of narrow caliber, and therefore more of them, than a typical specimen of *P. c. carpenteriana* of the same size. The other is a specimen of *Micrarionta levis*, taken by me on the salt flats south of Santo Domingo, Baja California, this past August. It is badly broken, only about half the body whorl remaining, but the peristome is complete and there is no doubt as to its sinistrality.—JOSHUA L. BAILY, JR.

VIVIPARUS MALLEATUS IN NIAGARA RIVER.—On Sept. 16th I found a 2⅜ inch dead shell of *Viviparus malleatus* Reeve on the Niagara River shore of Cayuga Island, Niagara Falls, N. Y. Today, Oct. 23rd, I picked up 4 live and 5 dead specimens ranging

in size from ½ to 2¼ inches. This seems to indicate that this shell has become established here. About 8 years ago we lived in the cottage in front of which these shells were found. At that time I purchased a pair of these snails from Beldt's Aquarium of St. Louis and was quite successful in raising them. Some of these shells must have been inadvertently dumped into the river and survived.—Eugene H. Schmeck, 8711 Buffalo Ave., Niagara Falls, N. Y.

A New Subspecies of Naesiotus quitensis from Ecuador.—Among several large lots of *Naesiotus quitensis* Pfeiffer sent to the U. S. National Museum by Mr. Ralph W. Jackson was a subspecies distinct from the other subspecies of this Ecuadorean snail, on which I recently published a paper (see Nautilus, vol. 53, no. 4, April 1940, pp. 111–118). This form may be diagnosed as follows:

Naesiotus quitensis antisana, new subspecies.—Shell moderately large, broader than the other subspecies except *Naesiotus quitensis orinus* Rehder, light brown or straw colored with dark chestnut axial bands of varying widths, occasionally almost obscuring the lighter base color, at least in the later whorls. Lip slightly reflected with a dark chestnut band just behind it. The edge of the reflected lip is whitish. All the dark bands show through on the inside of the shell.

The type, U.S.N.M. No. 516940, was collected on the slopes of Mt. Antisana, one of the peaks of the eastern range of the Andes, in the Province of Pichincha, Ecuador. It measures: Height 27.1 mm.; diameter, 14.4 mm.

The measurements of 100 specimens range as follows: Height, 19.9 to 28.8 mm.; diameter, 10.5 to 15.4 mm. The average measurements of these specimens are: Height, 24.7 mm.; diameter, 13.3 mm.

This race is readily distinguished from the other members of this complex by the contrasting dark chestnut axial bands against a pale brown background.—H. A. Rehder.

Long Beach Shell Club Semiannual Field Trip.—Members of the Long Beach, Calif., Shell Club met recently at Dana Cove, Dana Point, California, for the semiannual field trip. Although

the day was cloudy with frequent showers, 27 members spent a profitable afternoon along the rocky coast. The Emery Chaces took several Lamellarias, but as yet have not checked them for species. When it became too dark to turn over another rock the group went to the cabin of Mr. and Mrs. (President) Barnett for a baked bean dinner.

The club, in three years, has grown from a membership of 16 to a regular attendance of 35. Visiting conchologists are always welcome at club meetings, held the first Friday of each month in room nineteen of the Stevenson School, Sixth Street at Line Ave., in Long Beach.—LEONA LINDERMANN, Publicity Chairman.

A CERION FOUND IN BERMUDA.—This Cerion was found floating aperture up in the line of flotsam, at Cooper's Island, Bermuda, December 26th, 1926, by Mr. Louis L. Mobray. When given me by that gentleman in 1927, during my last visit to the Islands, he informed me, that the shell was empty and the aperture plugged with earthy material. How it arrived at Cooper's Island is open to two possibilities:—It was transported by the Gulf Stream and in this way have reached Bermuda where it was found; or, the shell being light and devoid of its animal contents, may have arrived through the agency of one of the frequent West Indian hurricanes, which are not infrequent visitors to the Bermudian shores. I have not attempted to identify the species, but Dr. Pilsbry considers it to be a form of *Cerion variabile* Dall, of Andros, Bahamas.—ARTHUR F. GRAY.

A NEW FORM OF *Urocoptis scobinata* TORRE & RAMSDEN.—*U. scobinata* was described in 1915 from Monte Toro (Nautilus 28: 133). When in Cuba in January, 1912, Mr. Walter F. Webb found a form of it at the foot of a flat-topped range north of the railroad station San Paz, east of Guantanamo. While it agrees with the type by the white color and in having crimped striae, it differs by the somewhat closer, more delicate striation, the less impressed sutures, and especially by having the peristome entirely free, being carried shortly forward, not "adnate for a short distance above." Length 35 mm., diameter above aperture 6.7 mm. This form may be called *Urocoptis scobinata perfecta*,

new subspecies. *Urocoptis* (*Idiostemma*) *pilsbryana* Ramsden occurred in the same place.—Pilsbry.

Liocentrum Pilsbry, 1902, Man. Conch. 15: 46, was preoccupied by *Liocentrum* Karsch in 1890, Ent. Nachr. 16: 272. The molluscan group may take the name *Gymnocentrum*, type *Coelocentrum filicosta* (Shuttleworth). Dr. Bartsch kindly called my attention to this double employ.—Pilsbry.

A New Locality for *Amnicola proserpina* Hubricht. This blind, subterranean snail has been previously known from only two localities (Nautilus 53: 121). Recently the author found it in Saltpeter Cave, three miles northwest of Minnith, Ste. Genevieve Co., Missouri. They were abundant and well developed, one specimen having seven whorls. In addition to the morphological characters listed in the original description this species differs from *Amnicola aldrichi antroectes* Hubricht in its behavior. When a rock with *A. a. antroecetes* upon it is removed from the water the snails remain attached, whereas *A. proserpina* will drop to the bottom as soon as the rock is disturbed. This makes their collection tedious and difficult since they must be located under water and removed with the forceps.—Leslie Hubricht.

Lymnaea stagnalis and *Lymnaea* (*Radix*) *auricularia*.—In the July number of the Nautilus (vol. 55, p. 19) Mr. W. J. Eyerdam makes the following statement: "*Lymnaea auricularia* intergrades closely into several races of *Lymnaea stagnalis*. . . ." In another place (p. 18) *auricularia* is said to compare quite closely with topotypes of *Lymnaea stagnalis occidentalis* Hemphill from Lake Whatcom, Washington. These statements should not pass without comment. *Lymnaea stagnalis* and *Radix auricularia* differ not only specifically but generically (or at least subgenerically) as was shown by me thirty years ago (Lymnaeidae of North and Middle America). On plate 10 figures are given of the genitalia of the two species (figs. A and C) and it is evident that they could not be specifically related.

The form of the shell cannot always be taken as a specific criterion in Lymnaea and its groups. In almost every species there

are forms in which the spire is shortened and the aperture enlarged. *Stagnicola emarginata* is a good example of this, some varieties ranging very close to *stagnalis* in the form of the shell, as in the race *magnifica* from Pelican Lake, Minnesota. *Mighelsi* and *valascnsis,* from Maine and Wisconsin respectively, are also of this nature.

I have examined a number of *Radix auricularia* and have never seen a specimen which at all resembled *stagnalis* or the race *occidentalis.* The types of Hemphill's *occidentalis* are figured on plate 23 (figs. 4–5) of the Lymnaea monograph. *Auricularia,* adult and immature, is figured on plate 22, figs. 12–15. It is possible, from Mr. Eyerdam's remarks concerning the statements of identification by Messrs. Bartsch, Vanatta and Walker, that the species in question is not *auricularia* but a form of *ovata* or *pereger.* However, none of these have anything to do with *Lymnaea stagnalis.*—FRANK C. BAKER.

THE TYPE LOCALITY AND DATES OF *Pecten imbricatus mildredae* BAYER.—In the description of this variety (NAUTILUS 55: 2, page 46) the author did not designate a type locality. Since the metropolis for this shell seems to be in the region of Miami, and the largest number of specimens are from this area, Biscayne Bay may be considered the type locality. Some dates, including the first record, are as follows:

1. January, 1935. Lauderdale by the Sea, Florida, Mrs. W. A. Royce.

2. July 3, 1938. Sand Key, 8 miles southwest of Key West, G. W. Van Hyning.

3. August, 1939, and 4. July 7, 1940, Biscayne Bay, W. A. Royce.

5. July, 1941. Carysfort Reef, 10 fathoms, A. H. Patterson.

6. August 1, 1941. Long Key Reef, Tortugas, T. Bayer and W. H. Sutcliffe.

I am indebted to Dr. T. Van Hyning for records 2, 3, and 4.—TED BAYER.

THE VAN HYNING COLLECTION OF FLORIDA SHELLS in The Florida State Museum now numbers 1213 species and subspecies well identified from Florida localities. There are also hundreds of

lots not yet identified. A typical specimen of each identified species and subspecies is now selected and arranged in their natural order on a table one hundred feet long, as a section of Mollusca of Florida, for the purpose of identification, and an exhibition series is being selected for the Hall of Mollusca.—T. Van Hyning.

An Abnormal Landsnail.—It seems desirable to report a scalariform, ultra-dextral[1] specimen of *Helminthoglypta umbilicata* (Pilsbry) which appeared among a group of laboratory-hatched young. The parent-material was collected near Santa Margarita, California (detailed locality cit. Naut. 54: 4, p. 122). When first noticed, the specimen's scalariformity attracted my attention—subsequent growth seems to have given the shell its pronounced ultra-dextral character.

With a companion, the abnormal specimen was segregated from the others and placed in a container where its development could be watched. From mid-April to its recent death sometime in the second week of October, 1941, the animal had made little growth although it survived a month-and-a-half aestivation. Its normal cage-mate is slightly over twice its diameter, they being 6 + mm. and 3 mm. respectively. I attribute the scalariform specimen's slow growth and ultimate death to an inherent weakness rather than to its living conditions, as other young living under similar circumstances grow and appear to be healthy. The abnormal specimen's shell has been sent to the Acad. of Nat. Sci. of Phila., and forms entry no. 178068 in their collections.—Glenn R. Webb, Indianapolis, Indiana.

PUBLICATIONS RECEIVED

Johnsonia. Published by the Department of Mollusks, Mus. Comp. Zool., Harvard Univ., Cambridge, Mass. No. 1: The genus Strombus in the western Atlantic. By Wm. J. Clench. 4to of 16 pp., 10 plates, printed as text figures. This is the first number of a series designed to include, eventually, all of the

[1] Cooke, A. H., 1895, Cambridge Nat. Hist., "Mollusca," Vol. 3. Cit. pp. 246–252.

marine mollusks of the American eastern seaboard. The numbers, we understand, are to appear at irregular intervals and each is to be complete for the genus or genera treated. The present part contains descriptions and excellent figures of the seven species and two subspecies of Strombidae. The name *S. raninus* Gmelin is properly used in place of *S. bituberculatus* Lam. It has long been known that Gmelin's name was prior, but Tryon and other authors preferred to retain the well-known Lamarckian name. No definite locality is given for *S. goliath* but it is known from places on the N. E. coast of Brazil below the Amazon mouth.

Johnsonia is handsomely printed. This part is priced $.45, and the very low yearly subscription rate of $3.00 is announced. —H. A. P.

HERMAPHRODITISM IN *Anodonta grandis*, A FRESH-WATER MUSSEL. By Henry van der Schalie and Fred Locke. Occas. Pap. Mus. Zool. Univ. Mich. No. 432. 14 sexually mature specimens of *A. grandis* were sectioned and studied. 9 were males, 3 were females and two were hermaphroditic. "The gonad appears to be made up of clusters or acini of sperm and eggs distributed throughout the connective tissue of the visceral mass. Ventrally and laterally, the gonad is surrounded by the muscles of the foot. Anterodorsally, it extends to the lobules of the liver or digestive gland, and posterodorsally to the top of the foot. The sperm and developing egg masses are separate, and there is no evidence from the material studied that both sperm and eggs are produced by the same gland at different seasons. In this respect *A. grandis*, as well as *A. imbecillis*, differs from *Ostrea edulis* as reported by Orton (1937: 85). Each acinus produces either eggs or sperm, and no acini were found which contained both sex elements." The relative obesity of the shell is considered not dependable in the determination of sex.—H. A. P.

IDA SHEPARD OLDROYD

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THE HABITS OF LIFE OF SOME WEST COAST BIVALVES

By DR. FRITZ HAAS

Chicago, Ill.

The observations upon which I am to report were made during my visit to California in the months of April and May of last year. Their accomplishment in such a short time would have been impossible without the accommodations for collecting and study which the Scripps Institution of Oceanography at La Jolla and the Hopkins Marine Station at Pacific Grove kindly put at my disposition; I was furthermore much helped by the active aid of West Coast malacologists and especially by Dr. Joshua Baily of San Diego and Dr. Myra Keen of Stanford University.

1. *The Boring of Lithophaga.* At the 1940 meeting of our society at Philadelphia, Dr. Bales reported on his observations on Floridan boring mussels and he touched on the problem as to how a bivalve with as soft and as smooth a shell as *Lithophaga* could successfully attack hard rock. In this connection, I then could refer to Kühnelt's experimental work with Mediterranean lithophagas, in which he proved that the carbonic acid produced by the animal's mantle edges is the solvent agent; this shows that *Lithophaga* is not a mechanical borer, as are the teredinids and pholadids, but a chemical one. This explanation of its boring powers is, of course, only true in the case of limestone rocks, and all the *Lithophaga* holes in the Mediterranean and the Floridan regions were indeed bored into calcareous rocks.

On the California coast, I collected *Lithophaga plumula* Hanley at La Jolla. To my great astonishment, this species had perforated what seemed to be a coarse sandstone, but how could a a siliceous rock be attacked by a chemical borer, with an acid no stronger than carbonic acid? A chemical and petrographical

analysis made it clear later, that while the rock in question is composed of medium to coarse grains of quartz and feldspar, these components are cemented together by calcium carbonate. This accounts for the possibility of its being drilled by *Lithophaga*. The cementing lime is first dissolved by the action of the carbonic acid, and the loosened grains of quartz and feldspar are then washed out by the water currents produced by the bivalve. The bore-hole is constantly lined with a thin layer of amorphous calcium carbonate.

The assumption that chemical boring is the only means of attacking a rock, even a sandstone like that described, is thus not contradicted, and is further supported. But it utterly fails to explain how *Lithophaga* can drill holes in the argillaceous shale. I found this kind of rock, which does not contain a trace of soluble lime, settled upon and perforated by *Lithophaga plumula*, both at La Jolla and at Pacific Grove. Chemical boring is completely out of the question in this case; mechanical drilling, by rotation of the shell, cannot be proven and is improbable, since the exterior surface of the *Lithophaga* shell does not exhibit any vestige of being worn or ground. As in bore-holes drilled in other kinds of rock, those in the shale are lined out with amorphous calcium carbonate. The fact that *Lithophaga* can drill holes in non-calcareous argillaceous rocks is thus established, but it cannot yet be explained in any way.

Lithophaga plumula is accompanied, in this shale, both by mechanical borers, such as *Venerupis lamellifera*, some pholadids and *Petricola carditoides*, and by a bivalve apparently unfit for boring, *Botula californiensis*, which probably bores by the same unknown means as *Lithophaga plumula*.

2. *Protective Coverings Built by Two West Coast Bivalves.* Very little is known about nest building habits of bivalves. Text-books, even the most recent ones, mention only the case of limids, which construct a kind of camouflaged nest from byssus-threads and shell fragments or stones, and that of juvenile mytilids, which occasionally have a similar habit. There are, however, other examples of this habit, as I had opportunity of learning on the Californian coast, where nest cases built by *Diplodonta orbella* Gould and by the myid *Cooperella subdiaphana* Carpenter are known.

Let us speak first of *Diplodonta orbella*. This species is rather common, and almost every shell collector on the West Coast knows that it has the habit of building a "nest," as the protective covering is called. Notwithstanding this knowledge, there are scarcely any hints in the literature referring to this nest-building habit. None of the textbooks mentions it, and only scanty, insufficient remarks in rather obscure places give evidence that the fact has been observed. I tried to trace back the literature on this subject and found, as the oldest quotation, a collecting notice in NAUTILUS, 9, 1895, p. 72, in which *Diplodonta orbella* is reported to have been collected "with nests"; the way these "nests" are mentioned, seems to allude to a matter of common knowledge. Josiah Keep, in the first edition of "West Coast Shells," (1893) does not say a word about the nest of our bivalve; so the first source of concise information about our subject is Dall's "Synopsis of the Lucinacea and of the American Species," 1901, where, on page 795, it is stated of *Diplodonta orbella* that "It is the habit of the animal to form a sort of nest of sand and adventitious matter, cemented by mucus, with long tubular openings, the whole of irregular form, but completely concealing the inmate." No picture is given. Josiah Keep, in the latter editions of the "West Coast Shells" (1904, 1911 and the 1935 edition revised by Dr. Joshua Baily), repeats this statement in almost identical words, adding the words "for the siphons," so that Dall's original description now runs "with long tubular openings for the siphons." Charles R. Orcutt's "Molluscan World" of 1915, which contains so many valuable observations on molluscan life, did not mention the *Diplodonta*-nest.

The first picture of such a *Diplodonta*-covering appeared in Johnson and Snook's "Seashore Animals of the Pacific Coast" in 1927; the text accompanying figure 416, on page 438, states "This species forms a protecting covering of sand cemented by mucus. The covering has long tube-like extensions in which the siphons lie, so that the mollusk is quite hidden." The 2nd edition of the "Seashore Animals of the Pacific Coast, from 1935," literally repeats this statement. Keen and Frizzell, 1935, mention only "nests" in connection with *Diplodonta orbella*. No further literature on this subject has come to my knowledge.

Thus by way of a résumé, our knowledge of the *Diplodonta*-nest consists of a rather vague description and of a single picture. This picture shows the partly broken covering exhibiting two long posterior extensions in which, according to the descriptions given by Keep and by Johnson and Snook, the siphons lie. But this explanation cannot be correct, at least concerning the specimen shown in my photograph, in which there is a third though shorter posterior extension, and no bivalve with three siphons is known! A still closer inspection of the specimen reveals the fact that the three extensions are not hollow tubes at all, but incrusted stalks of seaweeds; they cannot be, therefore, protective coverings of the siphon. They may be regarded as mooring ropes of the shell-covering, as a kind of protection against the shifting action of the waves. Nests with this structure constitute the most abundant type; they all exhibit extensions, variable in number and of variable length, which either still contain the stalks of seaweed or are hollow when their original axis of vegetable matter has become disintegrated. This type of nest is built from a felt-like material containing practically no mineral particles and consisting probably of disintegrated plant fibers, kept together by a cementing secretion of the animal. This type of nest may be found loose in holes and crevices of rocks or in empty bivalve shells in which they practically fill out the shole space between the living *Diplodonta* and the dead shell used as a shelter.

Besides the type of *Diplodonta*-nest just described, a rarer one may be found which corresponds much more closely to the descriptions cited above. Two specimens of *Diplodonta orbella* in coverings of cemented sand exhibit two long posterior extensions which correspond in position with the siphons of the enclosed animal. These extensions, however, are not hollow either, or at least are not originally hollow but certainly are incrustations of stalks of plant material also! Thus the explanation of these extensions of siphon-coverings, originated by Keep and carried along by Johnson and Snook, cannot be maintained and has to be given up in favor of their tentative explanation, as anchoring ropes, as a protection against the action of the waves.

My conclusions had come thus far, when it occurred to me that some information about the length and the general structure

of the *Diplodonta*-siphon might be important. It certainly *was* important, for the information I found in Dall's words (1901, p. 795) is as follows: "There are two entire siphonal orifices, without siphons." Where there are no siphons, no siphonal coverings are needed; thus the explanation of the nest extensions as siphonal tubes is entirely baseless.

In all the cases which came to my observation, the *Diplodonta*-covering seems to consist of two halves corresponding to the two valves of the shell, opening at the ventral side and united at the dorsal side of the animal. Nothing is known as yet of the way in which *Diplodonta orbella* constructs its two kinds of coverings, though it ought not be too difficult to watch its construction in an aquarium. It is hoped that my paper may stimulate some West Coast malacologist to study this interesting problem.

I mentioned above that the myid bivalve *Cooperella subdiaphana* Carpenter also has the habit of constructing a protective covering. I have not found one myself, but I saw specimens both in the Los Angeles Museum and in the Stanford University Collection. To the best of my knowledge, Keen and Frizzell (1935, p. 23) are the first to mention the *Cooperella*-covering, describing it as a "nest of agglutinated sand"; but no picture of the object has ever been published. The dried covering is rather solid; it is closed all around, leaving only a slit on the posterior extremity open for the communication of the inmate with the outer world.

COLLECTING IN MEXICO

By A. SORENSEN

On my three trips to Guaymas, Mexico, for the purpose of studying and collecting specimens of the wonderfully ample marine life there I made a number of observations, which may be worth recording. As a collecting place of marine life Guaymas can hardly be excelled for it has all the different kinds of shore fronts from sandy beaches to rocky stretches and offshore islands. Besides these the Miramar Lagoon, San Carlos Bay, Esterro Soldado and San Ramon Bay furnish, at low tides, sand spits, mud flats and large sand bars, all easily accessible by auto.

The gastropods here vary in size from the minute *Olivella dama* to the 12 to 13 inch *Fasiolaria princeps,* and hundreds of other species between in size. The sandbars are so well stocked with many species of bivalves that they furnish ample food for the multitude of gastropods that feed on them, as well as making excellent clam chowder for persons that will dig them.

One thing readily noticed as one visits this district at different times of the year is the preponderance of one species; say during January, of another more prominent during February and Mareh and still another in the warmer month of May. These have been my only months of visit for after that it gets too hot for comfort. For instance: in February 1940 there were many *Strombus gracilior* washed up on the sandy beach at Miramar. In May 1941 there were none to be found anywhere and dredging in from five to ten fathoms brought only a few; they had, no doubt, retreated to deeper and cooler water. In January 1942 they were on the beach and on the sandbars literally by the thousands.

That is only one of many similar cases. In May 1941 the *Murex bicolor,* the white murex that is so beautifully rose-colored inside, was so plentiful in 10 to 12 feet of water that a common hoop crab-net set from the boat-wharf and baited with a dead fish enticed more than fifty in one night into the trap. What a scent they must have. This year in January there were few, if any, off shore, but the sand bars in the bays anl lagoons were alive with them. Here they dig down in the sand and travel below the surface until they find a clam which they generally bring up. If the clam does not open soon enough to suit them they chip the lips of both valves enough to make a small opening and then suck them out. Many instances were observed of this actually being done.

In most cases they preferred a waiting game. Often two murices, generally *Murex nigritus,* the black one, had hold of one clam, one on each side firmly attached by suction. At times other hungry ones were attracted and I have twice counted five murices all attempting to have a taste of one clam, and that while the clam was still closed and alive.

While the murices depend on waiting or on chipping their

prey, the polinices and natieas depend on drilling a hole in one of the valves, generally near the hinge. I could go on giving examples of variation of the fauna present at different times, but I will just mention one more, *Turritella goniostoma*. In February and May of previous visits they were almost non-existent there except for the empty shells many of which had drilled holes showing their fate, but this year in January, in San Carlos Bay, they were spawning, and from a dozen up would be crawling in a limited space. They deposit a gelatinous string a half inch in diameter and more than twelve inches long, throughout which the large eggs show plainly.

There is no doubt that mollusks, like fishes, migrate to their spawning grounds, thus accounting for their absence or abundance at various seasons. But this is not always understood by amateur collectors who often complain about their lack of luck.

Much could also be said about the ecology of the different species. Some dwell on the sea floor, some on or among the rocks, and some in the sand. But that would be another story.

OBSERVATIONS UPON A FLORIDA FORM OF VIVIPARUS

By CALVIN GOODRICH

Mr. T. Van Hyning of the Florida State Museum recently sent me *Viviparus georgianus* form *walkeri* (Pilsbry and Johnson), containing soft parts, that had been taken in Sante Fe River, Alachua County, Florida, on May 22, 1941. It was a simple matter to separate the sexes—in the case of females mostly by the presence of ova and embryos, in that of the males by the tentacles, one of which is a generative organ. The sending was made up of 447 specimens. The females numbered 358, the males 89. This is almost exactly four females to one male, or put another way, 80.0 per cent females and 19.9 per cent males.

In the course of a detailed study of *V. bengalensis* (Lamarck), Annandale and Sewell (1921) found that the sexes of a single year's brood were "roughly" four females and one male. A report upon *V. crassus* (Hutton) from which these authors quote

gives a ratio of approximately three females to two males. Van Cleave and Lederer (1932), using *V. contectoides* Binney as their material, met with a similar ascendancy of females over males in seven samples. In two other samples, however, there were more males than females. In the whole nine samples, the ratio of females to males varied from 0.28 : 1 to 3.38 : 1.

Still, the authors are not inclined to believe the sexual inequality to be the rule. "From all the data before us," they have written, "it seems that at birth the two sexes are present in equal numbers. By midsummer the longer life span of the females [which they were able to demonstrate] has the cumulative effect of producing a preponderance of females in the ratio of 1 male : 1.3 or 1.4 females. By late fall or midsummer the older males die off, leaving the young males of the preceding period of parturition. By this elimination of males, the cumulative effect of simultaneous existence of two or three generations of females continues to magnify the advantage of the females in the ratio until there may be two or three females to a single male. This condition persists until the following spring, when the new brood, again with equivalent numbers of the two sexes, brings back the male ratio to the proportion characteristic of midsummer."

It might well be that the sexual disproportion observed by several persons, including Van Cleave and Lederer, has been due to faulty sampling or collecting, to differences in viability or even to a certain habit of secretiveness on the part of the males. Yet before that is admitted without dispute, two facts, surely having a bearing on the case, should be considered. One is that *Campeloma,* related to *Viviparus,* has a sexual inequality, that is admitted and notorious, and is wholly convincing to anyone who sets out to find a male; the other, that the anatomy, and hence the physiology, of a freshwater genus of gastropods are much alike. So a sexual disproportion in *Campeloma* tends to support a belief in real sexual dis-proportion in *Viviparus.*

That females in *Viviparus* reach a greater size than males has been noted by Annandale and Sewell as also Van Cleave and Lederer, and the former authors pointed out that this was observed by Lister in 1695 in the instance of *V. viviparus.* Exact measurements of the height of *V. georgianus* form *walkeri* could

not be made because the spires of all the older shells of the Van Hyning sending were eroded. As an alternative, an index of obesity was calculated by dividing the height of the last three whorls by the diameter. In twenty females, the average index was 86.1 per cent; in twenty males, 87.4. It would appear from this that proportionally males were about as obese as females. Nevertheless, the diameter of the largest female was 24 mm., and that of the largest male 20.50. As Call (1888) learned that female *Campeloma subsolidum* (Anthony) was larger than the male shell, thirty-six specimens of each sex being chosen for measurement, it may be suspected that a greater gross bulk in females over males is common throughout the Viviparidae. The smallest female *walkeri* from Sante Fe River that was found with eggs was of four whorls, the spire entire. Its altitude was 20 mm., diameter 17.50 mm. In all likelihood it had come to sexual maturity and was bearing young within a year of its own birth.

Eighty-eight eggs and embryos were counted in a female *walkeri*. This may be compared with findings by Crabb (1929) of 130 eggs in a specimen of *V. contectoides* and an average of eighty-six plus in eight examples of introduced *V. malleatus*. As the marsupium of *Viviparus* is a sort of assembly line starting with undeveloped ova, grading to embryos and then on to young ready for discharge, the line sometimes crowded and sometimes not, such counts, one may suppose, are bound to vary a great deal. *V. contectoides* under the observation of Dr. Crabb was discharging eggs and embryos at the end of March. Females of *walkeri* gorged with eggs and juveniles were collected about two months later than this. Van Cleave and Lederer learned that "the most active period of liberating young" *contectoides* "seems to fall in the months of March and April in central Illinois" and, in New York, "from some time in March to June." As young of the Florida shells taken in May were ready for liberation, if actually some had not been going through that course already, it is perhaps impossible—on the basis of data from four widely separated localities—to be confident that climatic conditions decide the times of discharge. Very young embryos of *walkeri* are thin, crystalline white and transparent; those about to be extruded dark reddish brown and relatively thick. No trace of revolving color bands

was seen in any of the embryos, but this may have been due to the preserving liquid which first was formalin and then alcohol. The largest measured embryo was of three and one-eighth whorls and had a diameter of 6 mm., an altitude of 4.30 mm.

A generic character of *Viviparus* is a row or rows of epidermal elevations broken into projections that sometimes are of such prominence as to constitute bristles. Embryos of *walkeri* two whorls in size have ten to twelve such lirations above the periphery, as many or more below it which are less sharply defined. Forty-five of these lines were counted in an adult example. It required manipulations of lighting on Dr. Annandale's part to make out ridges in the shell material of *bengalensis* corresponding to those in the epidermis, but in several individuals of *walkeri* this basic sculpture proved to be quite plain even without magnification. Recently, *Campeloma* of some upper Michigan localities was found to retain lirations into adolescent age just as *V. walkeri* of Sante Fe River does much longer. It may be that environmental conditions govern in the matter.

Of the 358 females of *walkeri*, 242, or 67.6 per cent, had revolving color bands. The rest were without signs of them. The banded males were 62, or 69.6 per cent of this sex. Seemingly, then, there is no correlation between sex and banding. The shells having the deepest ground color were the very young to those half-grown. This color tends to fade in the mature and there is besides some reduction of pigmentation which is due to abrasion.

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CERTAIN REMARKS ABOUT LABELS

By CALVIN GOODRICH

Among shells recently received from Mr. C. S. Shoup, of Tennessee, were specimens having a label that, in addition to the usual terse locality data, bears the information, "This is at the site of 'Maggie's Mill,' where the song, 'When You and I Were Young Maggie,' was written."

The occasions upon which anyone similarly has taken the trouble to record a casual observation or an incident or to register comment are so rare in my experience that I think I can remember all that ever have met my eyes. Labels long ago became conventionalized or ritualized into something as arid and stark as a military communique. It might seem to a person who for the first time saw a hundred or two of the things that when it came to label-writing the ink of the fountain pen was at the point of exhaustion or that the pencil used was a borrowed one the owner whereof was snatching away. Orthography at the moment is afflicted with cramp. The occasions aforementioned are:

With his types of *Melania brevispira,* Mr. J. G. Anthony made the notation, "New species det. when I was blind, by touch alone."

A label of Mr. W. W. Calkins reads as from the "Battle Field of Chickamauga, near which on the second day of the battle I was wounded."

Dr. James Lewis for once avoiding a decision on a perplexing specimen, put down, "What the hell, who can tell?"

These exceptions to a general tongue-tied rule have been found refreshing and interesting and to some degree stimulating, and I am bold enough to think that this would prove the case with others than myself. Small adventures occur on even short collecting expeditions. A person comes unexpectedly upon such bits of local pride as Mr. Shoup did. A farmer who wants to know what in blazes you are doing on his land may end by insisting that you come to dinner. Sometimes even the wealthy pre-emptors of government-owned beaches turn out equally as hospitable. Word of mouth accounts of the happenings go with the winds. Suppose now that Dr. Walker, home after a trip into the low grounds

south of Detroit, had pencilled a label, "Lost a boot this day in the mud of a slough," or that Dr. Ortmann had thus commemorated an event, "Obtained these shells by the grace of moonshiners who first mistook me for a revenue officer and were in mind to deal with me accordingly," or, again, that Mr. Clench had chronicled, "Here I broke a rib pulling Okkelberg out of the water"—these real and, in the telling, pleasurably exciting occurrences would not have been lost to that part of conchological history which in particular is of human interest.

Mr. E. B. Williamson collected fresh-water clams before he did dragon-flies, and so an incident of his career can be tugged into this argument. He went out from Pittsburgh to an upstream part of the Allegheny River in the period in which railroads promoted Sunday excusions. Careful of a new pair of trousers, he changed into overalls behind a bush. On the river, he recognized a species of dragon-fly which he knew to be represented in museums by only two specimens. All day he slopped up and down the shallows and bars. All day he swung his insect net like a gesticulating senator. He whooped elation over a catch and cursed the ones that got by him. He was in the state of mind that Tom McGinty would be on his Florida shore had Tom tripped over one of Captain Kidd's treasure chests. A toot of the locomotive whistle brought Williamson back to the train, loath to depart. Halfway home, he discovered that he'd left his trousers in their hiding place. Surely, his labels would have been enriched if he had gone beyond details of locality and the prescribed entomological memoranda and written, "This is the spot where I lost my pants."

FOUR NEW GASTROPODS FROM THE GULF OF CALIFORNIA

By J. WYATT DURHAM

A Contribution from the Museum of Paleontology, University of California, Berkeley, California

On the cruise of the *E. W. Scripps* to the Gulf of California, in the fall of 1940, a number of mollusca were collected in snapper samples and cores from various depths. These mollusks were

identified by Mr. A. M. Strong of Los Angeles who suggested that the present author undertake the descriptions of the following new species. Mr. Strong's help is gratefully acknowledged.

From locality A 3599, in Sal Si Puedes Channel between the San Lorenzo Islands and Peninsula of Lower California, *Trophon lorenzoensis* n. sp. and *T. diazi* n. sp. were brought up in the mud on a mushroom anchor from a depth of 860 fathoms. They were associated with *Crassinella varians* (Carpenter), *Pecten pernomus* Hertlein, *Solemya panamensis* Dall, *Tellina paziana* Dall, *Cypreolina margaritula* (Carpenter), *Turbonilla* (*Strioturbonilla?*) sp. indet. and *Cadulus panamensis* Sharp and Pilsbry. This locality is apparently an isolated deep basin with a sill at a depth of about 150 fathoms. The bottom temperature is over 11° C. whereas the normal temperature for this depth in the open Gulf is close to 4° C. From the data obtained at this station it appeared that there is a bottom current of at least one half knot per hour. It is possible that the new species may be endemic to this basin, being isolated by the surrounding shallow water.

Vitrinella tiburonensis n. sp. was collected in 393 meters depth at loc. A 3634, lat. 28° 46.8′ N, long. 112° 51.3′ W, west of Tiburon Island. It was associated with *Phacoides mazatlanica* Carpenter, *Sphenia* sp., *Tellina* sp., *Acteocina smirna* Dall, *Alvania monserratensis* Baker, Hanna and Strong, *Cyclostrema* sp. indet., *Delphinoidea* cf. *spiritualis* Baker, Hanna and Strong, *Delphinoidea* sp., *Epitonium appressicostatum* Dall?, *Scissilabra* sp. indet., and *Turbonilla* (*Strioturbonilla*) n. sp.

Vitrinella guaymasensis n. sp. was associated with the following species:

	Guaymas	Conception Bay	
	A 3603	A 3627	A 3628
Acra nux Sowerby		x	x
Chione gnidia (Broderip and Sowerby)	x		
Corbula nuciformis Sowerby		x	
Cuspidaria dulcis Pilsbry and Lowe		x	
Laevicardium elenense (Sowerby)		x	
Pecten circularis Sowerby		x	
Acteocina carinata (Carpenter)	x	x	x
Alabina diomedae Bartsch	x	x	x
Caecum firmatum Adams	x		x

	Guaymas A 3603	Conception Bay A 3627	A 3628
Circulus cerrosensis Bartsch		x	
Crepidula sp.	x		
Cylichna defuncta Barker and Hanna		x	x
Cyclostrema cf. *xantusi* Bartsch	x		
Epitonium sp.			x
Iselica maculosa (Carpenter)		x	x
Mangelia sp.		x	
Melanella cf. *abreojosensis* Bartsch		x	
Nassarius versicolor (Adams)		x	
Odostomia (*Besla*) *convexa* Carpenter		x	x
Odostomia (*Chrysallida*) *telescopium* Carpenter	x	x	x
Odostomia ? sp.		x	
Pyramidella (*Triptychus*) *hermosa* Lowe	x		
Retusa luticola Adams			x
Turbonilla (*Bartschella*) *subangulata* Carpenter			x
Turbonilla (*Chemnitzia*) *muricata* Carpenter	x		
Volvulella cylindrica Carpenter ?			x
Cadulus panamensis Sharp and Pilsbry		x	x

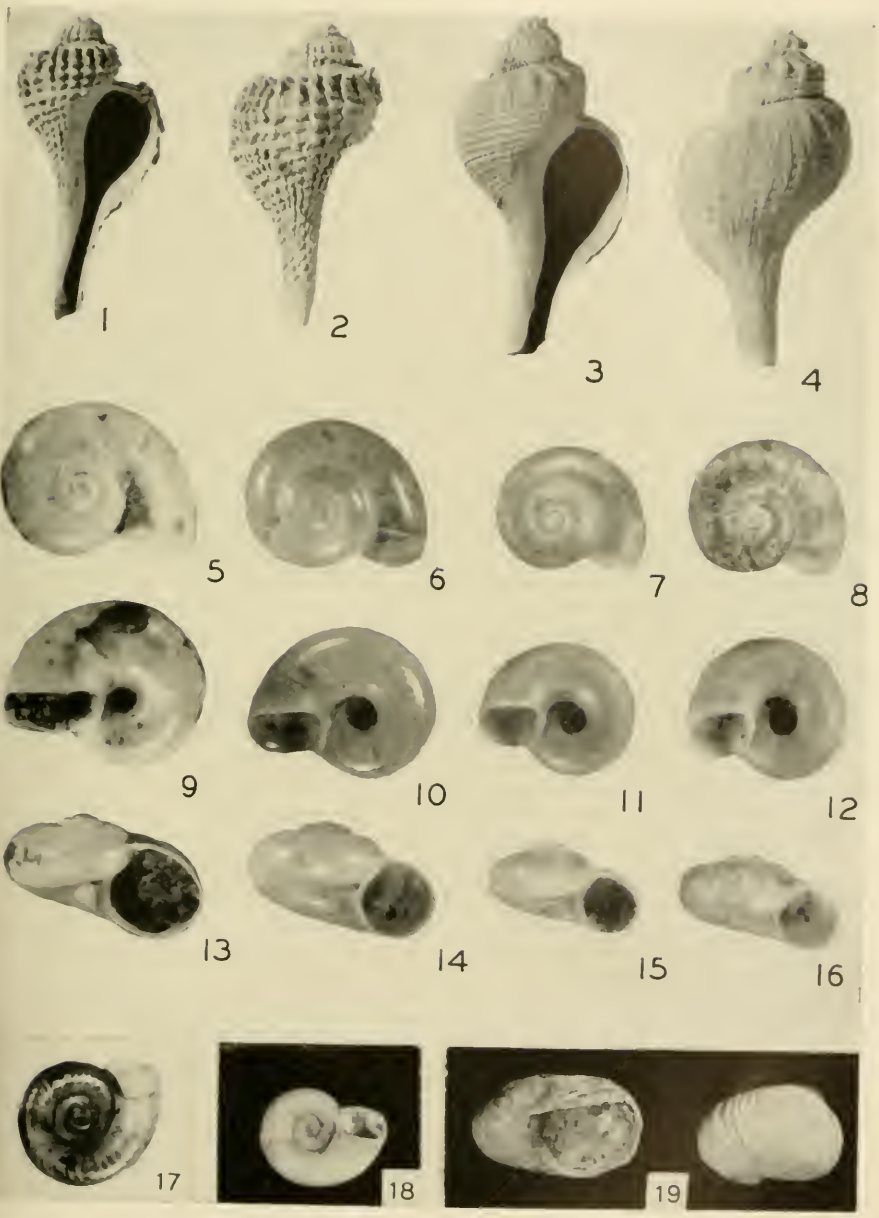
Locality A 3603 is from a depth of 4 meters, localities A 3627 and A 3628 from depths of 26 meters.

Most of the specimens from localities A 3603, A 3627, A 3628 and A 3634 are of small size, falling in the general size range often called "submegaseopie."

The description of the new species follows:

TROPHON (BOREOTROPHON) DIAZI n. sp. Pl. 8, figs. 3, 4.

Shell of medium size, over four whorls (nuclear missing), spire of medium height, anterior canal moderately long and narrow; early whorls slightly tabulate, body whorl rounded; penultimate whorl with seven rounded spiral ribs below the tabulation, interspaces slightly smaller, two upper spiral ribs slightly smaller than remainder; about 14 moderately distinct axial ribs on penultimate whorl, beginning just below suture and directed posteriorly on the tabulation, producing a small node on the angu-



Figs. 1, 2, *Trophon lorenzoensis* n. sp. - 1.7, holotype. Figs. 3, 4, *Trophon* (*Borcotrophon*) *diazi* n. sp. - 1.7, holotype. Figs. 5, 9, 13, *Vitrinella tiburonensis* n. sp. - 15, holotype. Figs. 6, 10, 14, *Vitrinella guaymasensis* n. sp. - 15, holotype. Figs. 7, 11, 15, and 8, 12, 16, *Vitrinella guaymasensis* n. sp. - 15, paratypes. Figs. 17, 18, *Gyraulus cressmani* n. sp., type and paratype. Fig. 19, *Parapholyx packardi corrugata* n. subsp., type.

lation and then directed anteriorly on the lower part of the whorl, becoming obsolescent about half way to the suture; last half of body whorl with axial ribs replaced by irregular heavy growth lines; suture abutting; body whorl with about 12 spiral ribs, not extending down onto the anterior canal which is smooth; aperture ovate, anterior canal of moderate length, not reflexed, lower end rather square; inside of outer lip smooth, a slight callus wash on the columella.

Dimensions of holotype: height 25.9 mm., diameter of body whorl 13.0 mm., length of aperture and anterior canal 18.4 mm.

Holotype: Univ. Calif. Mus. Paleo. no. 14800, loc. A 3599.

Occurrence: loc. A 3599, Sal Si Puedes Channel, between the San Lorenzo Islands and the Peninsula of Lower California, depth 860 fathoms.

Remarks.—This species was at first confused with *T. lorenzoensis* n. sp., assuming that the varices of that species has been worn off. However, detailed examination reveals that the number of spiral ribs is greater, the spire is higher, the anterior canal is slightly shorter and not reflexed, and the spiral ribs do not extend onto the anterior canal. It is possible that this species should be refered to some other genus.

TROPHON LORENZOENSIS n. sp. Pl. 8, figs. 1, 2.

Shell of medium size, about four whorls, including partially eroded nuclear whorls (slightly over one whorl); spire of medium height, upper surface of whorls tabulate, sides rounded; penultimate whorl with three rounded spiral ribs about as wide as their interspaces, post nuclear whorl with two spiral ribs, the third being intercalated at about the beginning of the third whorl; body and penultimate whorl with moderately prominent lamellar varices, 22 in number on the body whorl; varices with a small "spine" on the angulation at the edge of the tabulation, accenting the angle; 21 spiral ribs on the body whorl extending down nearly to the tip of the anterior canal; anterior canal very long, slightly reflexed posteriorly, tip somewhat pointed; aperture ovate, outer lip with 8 grooves corresponding to the spiral ribs on the surface; inner lip covered with a callus wash.

Dimensions of holotype: height 23.3 mm., diameter of body whorl 11 mm., length of aperture and anterior canal 18.5 mm.; of paratype, height 12.3 mm., diameter of body whorl 6.5 mm., length of aperture and anterior canal 9.4 mm.

Holotype: Univ. Calif. Mus. Paleo. no. 14798, loc. A 3599; paratype no. 14799, loc. A 3599; a paratype in the collection of A. M. Strong.

Occurrence: loc. A 3599, Sal Si Puedes Channel, between the San Lorenzo Islands and the Peninsula of Lower California, depth 860 fathoms.

Remarks.—The paratype is an immature specimen with the lamellar varices not so well developed.

VITRINELLA GUAYMASENSIS n. sp. Pl. 8, figs. 6–8, 10–12, 14–16.

Shell minute, turbinate, translucent, rarely somewhat porcellaneous; whorls three and three fourths to four, nuclear whorls not demarcated, well rounded, ornamented by lines of growth only; sutures abutting, distinct; umbilicus large, extending to apex of spire; columellar wall of whorls well rounded; peristome complete, with a heavy callus on inner lip; aperture oblique, subrounded.

Dimensions of holotype: diameter 1.6 mm., height 1 mm.

Holotype: Univ. Calif. Mus. Paleo. no. 14802, loc. A 3627; paratypes Univ. Calif. Mus. Paleo. 14803, loc. A 3627, 14804, loc. A 3603, 14805, loc. A 3603; two paratypes from loc. A 3627 in the collections of A. M. Strong.

Occurrence: loc. A 3603, Guaymas harbor, Sonora, Mexico (depth 4 meters); locs. A 3627, A 3628, Conception Bay, Lower California (both from a depth of 26 meters).

Remarks.—This species differs from *V. oldroydi* Bartsch (Proc. U. S. Nat. Mus., vol. 32, pp. 167–168, figs. 1a, 1b, 1c, 1907) by having a higher spire and abutting suture. From *V. smithi* Bartsch (Proc. U. S. Nat. Mus. vol. 70, Art. 11, p. 33, pl. 4, figs. 6, 8, 9, 1927) it may be distinguished by having approximately four whorls, a slightly lower spire, and proportionally narrower width to each whorl.

VITRINELLA TIBURONENSIS n. sp. Pl. 8, figs. 5, 9, 13.

Shell minute, turbinate, porcellaneous; whorls about four, rounded, ornamented by growth lines only, nuclear whorls not demarcated; suture abutting, distinct, umbilicus moderately small, extending to apex of spire, columellar wall of whorls somewhat flattened; peristome complete, with a rather thin callus on the inner lip; aperture oblique, subrounded, profile from above and below fairly straight.

Dimensions of holotype: diameter 1.9 mm., height 1.1 mm.

Holotype: Univ. Calif. Mus. Paleo. no. 14801, loc. A 3634.

Occurrence: loc. A 3634, west of Tiburon Island, Gulf of California, (depth 393 meters).

Remarks.—This species is readily distinguished from *V. guaymasensis* n. sp. and other Vitrinellas of the Pacific Coast by the small umbilicus with fairly straight columellar walls and by the relatively straight profile of the lip when viewed from above.

SUPPLEMENTARY NOTES ON THE FOOD OF THE LIMPKIN

By CLARENCE COTTAM

Because our knowledge of the food of the Limpkin (*Aramus pictus pictus*) is so fragmentary and the distribution of this interesting bird is so restricted, it seems desirable to report a little additional information that has come to light. The range of the Limpkin appears to be so restricted and the bird itself so unadaptable that it could easily be exterminated. Presumably, too, the Limpkin subsists almost entirely upon one species of gastropod, *Pomacea paludosa* (Say).[1]

Our present knowledge of the food habits of the bird has been summarized by Bryant (1859), Cottam (1936), Harper (1936a, 1936b, 1941), and Howell (1932).

Bryant referred to the Limpkin's feeding on a species of *Natica* on Lake Dexter or on St. John's River in Florida, and this statement was quoted by Cottam. Harper (1941) has shown that the snail is probably the fresh-water gastropod, *Viviparus georgianus;* noting that this is a fresh-water area; Harper comments that *Natica,* being a marine mollusk, could not survive the fresh-water conditions occurring there.

Cottam reported upon the laboratory analysis of 30 birds col-

[1] Harper (NAUTILUS, vol. 55, p. 3) reported on "the apparent absence or at least scarcity of *Pomacea*" in Mill Creek, Camden County, Ga., the only regular habitat of the Limpkin in the state, as far as known at present. While his paper was going through the press, *Pomacea paludosa* was finally discovered in that creek by Messrs. R. A. McLean and G. A. Coventry, who collected a quantity of the mollusks and observed a number of egg-clusters. This find tends to emphasize the dependence of the Limpkin upon *Pomacea.*—EDS.

lected throughout the range of the species during a long period of years. He reported that *Pomacea depressa* (*paludosa*) constituted 70 per cent of the food, an undetermined gastropod—probably largely or entirely *Pomacea*—made up 26.66 per cent, *Campeloma* formed 3.33 per cent, and plant fiber made up 0.01 per cent. The percentage of *Campeloma* was based upon one stomach reported to contain 10 of these mollusks as the entire meal.

Identification of the gastropods eaten by the Limpkin is difficult because the bird takes none of the shell of any mollusk, regardless of its small size. Consequently, identification must be based upon the operculum (when it occurs) and upon the radula or molluscan teeth. The *Campeloma* identification made in 1923 has lately been found to be an error, despite the fact that the determination was made by a widely recognized and competent conchologist. Recent re-examination of the stomach containing 10 of these mollusks showed that the content comprised about 75 per cent of *Pomacea paludosa* and 25 per cent of *Viviparus,* either *V. georgianus* or *V. waltoni.* On the basis of the above-mentioned 30 stomachs, the percentages should have read: *Pomacea paludosa,* 72.50 per cent; *Viviparus* sp., 0.83 per cent; undetermined gastropod (probably largely *Pomacea*), 26.66 per cent; and plant fiber, 0.01 per cent.

An additional stomach recently analyzed in the laboratory of the U. S. Fish and Wildlife Service showed the following remains: many *Pomacea paludosa,* 54 per cent; comminuted filamentous algae (which appeared to have been ingested by the snails), 34 per cent; 126 seeds of *Scirpus californicus,* 6 per cent; 3 fly larvae (Muscidae), 2 per cent; 6 seeds of *Cladium jamaicense,* 2 per cent; 3 seeds of *Hydrocotyle* sp., 2 per cent; 1 beetle larva (Curculionidae), trace; 1 scale of a fish, trace; 1 seed of *Eleocharis* sp., trace; 1 seed of *Sparganium eurycarpum,* trace; 1 seed of *Verbena* sp., trace; 1 seed of Labiatae, trace; and undetermined vegetable fiber, trace.

These analyses indicate that some vegetable food (mostly seeds) and insect larvae are at times purposefully ingested. Though *Pomacea* constitutes the major and staple food item, other gastropods are consumed when the accustomed food is wanting.

Dr. Alexander Wetmore, Assistant Secretary of the Smithsonian Institution and in charge of the U. S. National Museum, has kindly submitted to the writer some of his unedited field notes describing the method whereby the Limpkin eats. These notes are so illuminating that they are quoted herewith:

"Paradise Key, Florida, February 21, 1919.—This morning I spent another hour in watching these birds. They fed on an open 'prairie' covered with a scanty growth of saw grass, an opening that a short time before had been covered with water and that was still boggy underfoot. The large fresh-water snail *Pomacea depressa* was common here and was embedded in the mud beneath an overlying mass of drying confervae. The limpkins walked about peering at the surface or probing likely appearing places with their bills. At intervals one would locate a snail and pull it out, immediately straightening up with the shell held in the tip of the beak. After gazing around the bird would bend down, seat the shell in the mud, poke at it for an instant and then raise the head for a second. A second period of probing ensued after which the head was raised with animal in the bill and the snail was swallowed.

"February 23, 1919.—This morning I walked out to investigate the area where the limpkins had been feeding. From their tracks still clearly shown in the mud I was able to figure out the manner in which this was done. The birds walked along occasionally probing a spot to a depth of three or four inches in search for shells. When one was found it was dragged out leaving a clean round hole sometimes 6 inches deep. The bird then seated the shell firmly in the mud with the aperture directly up. The sharply pointed mandibles were worked down on either side of the operculum and it was torn off and discarded, falling from one to twelve inches away. This was done as the head was raised. The snail was then extracted and eaten. All this was done neatly and in the majority of cases without marring the shell though in a few instances the margin was chipped slightly. These opened shells, opening up, with the operculum lying a few inches away, were scattered at intervals of 10 to 50 feet all over the prairie."

Laboratory analysis shows that many opercula are swallowed with the fleshy parts of the gastropods, although none of the hard, calcareous shell is ingested.

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NOTES ON THE NAME *LITIOPA MELANOSTOMA* RANG AND DISTRIBUTION OF THE SPECIES

By KATHERINE V. W. PALMER

The use of the name, "*Litiopa bombyx* or *bombix* Rang, 1829," in present American literature for *L. melanostoma* Rang, the small pelagic gastropod of the Atlantic and Pacific coasts, is is erroneous, both for the species and author. Since the name is being used in the latest checklists and manuals[1] of the two coasts, it seems proper to call attention to the misnomer.

Rang never named a species of *Litiopa*, *bombyx* or *bombix*, particularly in 1829. In that year, he[2] described the genus *Litiopa*, differentiating two species as new *L. melanostoma* and *L. maculata*, in that order of description. *L. melanostoma* has priority in naming. Kiener,[3] in 1833, made further observations

[1] Dall, W. H., U. S. Nat. Mus., Bull. 112, 1921, p. 155; Dall, W. H., U. S. Nat. Mus. Proc., vol. 70, no. 2667, 1927, p. 118; Oldroyd, Ida, Shells West Coast N. Amer., vol. II, pt. III, 1927, p. 72; Johnson, C. W., Boston Soc. Nat. Hist., Proc. vol. 40, No. 1, 1934, p. 100; Smith, Maxwell, East Coast Marine Shells, 1937, p. 97.

[2] Rang, P. S., Ann. Sci. Nat., vol. 16, 1st ser., 1829, p. 307.

[3] Kiener, L., Ann. Sci. Nat., vol. 30, 1833, p. 221.

on Rang's genus *Litiopa*, deducing that the two species of Rang displayed only differences of sex and age. Accordingly he suppressed the two specific names of Rang "because they made only one." In place of Rang's names, Kiener, "to recall the habitudes of the animal," proposed the name *Litiopa bombix*. In using the name, *L. bombix*, one must attribute the authorship to Kiener, 1833. In conformity with the rules of modern nomenclature, Kiener's procedure is not justifiable and *L. bombix* falls in synonymy, in whole or in part, with *L. melanostoma* Rang or *L. maculata* Rang unless by the three figures given by Kiener for *L. bombix*, that species is proven distinct from the two of Rang. *L. bombix* and *L. melanostoma* have been frequently listed as synonymous and one of Kiener's figures illustrates a shell with a "black-margined aperture." The error usually continued is in giving *L. bombix* priority.

Apparently Gray[4] occasioned the use of *L. bombix* Kiener, in 1847, when designating it as the type of *Litiopa*. H. and A. Adams[5] used the same name but inadvertently accredited the species to Rang. The Adamses were followed by Chenu,[6] Verrill[6] and others writing in more recent literature. Dall,[7] in Bulletin 37, uses *L. bombyx*, correctly crediting Kiener for authorship and some later writers followed that usage.

The name *L. melanostoma* Rang is properly used in the Rept. of the Challenger Exp.[8] and in Tryon's Manual but their influence seems to have been little felt in American literature except by Sumner,[9] Hornung and Mermod[10] followed Tryon's usage when

[4] Gray, J. E., Proc. Zool. Soc. London, 1847, p. 155.

[5] Adams, H. and A., Genera Recent Mollusca, vol. I, 1854, p. 325. *L. bombyx* Rang.

[6] Chenu, J. C., Man. de Conch., vol. I, 1859, p. 304, fig.; Tryon, G. W., Jr., Man. Conch., vol. 9, 1887, p. 281 in synonymy; Verrill, A. E., Conn. Acad. Sci., Trans., vol. 5, 1882, p. 523.

[7] Dall, W. H., Bull. U. S. Nat. Mus., No. 37, 1889, p. 148; Mazÿck, W. G., Cat. Moll. S. Carolina, 1913, p. 15; Maury, C. J., Bull. Amer. Paleont., vol. 9, No. 38, 1922, p. 107.

[8] Watson, R. B., Challenger Rept., Zoöl., vol. XV, 1886, p. 572; Tryon, G. W., Jr., Man. Conch., vol. 9, 1887, p. 280, pl. 53, figs. 72–75, 78.

[9] Sumner, F. B., Osburn, R. C. and Cole, L. J., Bull. Bur. Fisheries, vol. 31, pt. 2, 1913, p. 720.

[10] Hornung, A. and Mermod, G., Ann. Mus. Civ. Storia Nat., vol. LII, 1925, p. 203; vol. LIII, 1928, p. 120.

identifying *L. melanostoma* from the Red Sea and Thiele used it so in his Handbuch.

Rang did not specify a type for his genus *Litiopa*. The first direct designation of type is apparently that of Nevill, 1884,[11] *L. melanostoma* Rang. Gray,[12] in 1847, designated *L. bombix* Kiener. Such a designation will be the first made indirectly, if *L. bombix* is synonymous with *L. melanostoma* Rang only, *i.e.*, by the original illustrations of *bombix* or if *L. melanostoma* and *L. maculata* are regarded as the same species.

A fact in the distribution of *L. melanostoma* Rang seems to have been overlooked. The original form, including a large number of individuals, was first found on *Sargassum natans* (L.) off Newfoundland by the Captain of the frigate Bellanger, who conveyed preserved creatures to Rang. Authors follow Verrill (1882) and Dall (1889) and limit the northern range to Martha's Vineyard. According to Winge[13] the northwestern boundary of the Sargasso Sea or the distribution of *Sargassum* occurs north of 40° N. Lat. only during the summer and autumn. During those periods, the northwestern distribution of the Sargasso Sea extends off Newfoundland. Therefore, probably the original specimens were collected during the summer or fall. Since the living animals were taken off Newfoundland, the extension to Newfoundland should be included in the range of the species.

A NEW GYRAULUS FROM THE PLEISTOCENE OF CALIFORNIA AND A NEW PARAPHOLYX FROM A SUPPOSED PLIOCENE DEPOSIT IN OREGON

By FRANK C. BAKER

GYRAULUS CRESSMANI new species. Pl. 8, figs. 17, 18.

Shell of about the size of *Gyraulus vermicularis* (Gould), of 3½–4 rounded whorls rapidly increasing in diameter, the sutures deeply impressed, the inner whorls of the right side below the level of the body whorl; left side with rounded whorls and deep

[11] Nevill, G., Handlist Moll. Indian Mus., Pt. II, 1884, p. 177.

[12] Gray, J. E., Proc. Zool. Soc. London, 1847, p. 155.

[13] Winge, O., Rept. Danish Ocean. Exped., 1908–1910, No. 7, vol. III, Misc. Pap. 2, 1923, pp. 15, 16, Fig. 2.

sutures; periphery rounded; aperture rounded and obliquely deflected; sculpture of coarse growth lines, sometimes slightly costate, with more or less deeply incised spiral lines.

H. 1.5; Gr.D. 4.0; L.D. 3.3; Aperture H. 1.0; D. 1.5 mm. Holotype. No. 3982.

H. 1.5; Gr.D. 3.8; L.D. 3.0; Aperture H. 1.3; D. 1.1 mm. Paratype. No. 3983.

H. 1.5; Gr.D. 3.8; L.D. 3.0; Aperture H. 1.3; D. 1.1 mm. Paratype. 3983.

Locality and horizon: South end Lower Klamath Lake, sections 25 and 26, T. 47 N., R. 2 E., Mt. Diablo Merid., Siskiyou Co., California, about 8 miles south of the Oregon state line. The shells occurred in a test pit (no. 1) sunk for archaeological investigation and were found at depths of from three to ten feet. The deposit is late Pleistocene according Dr. Antevs.

This Gyraulus differs from the common *Gyraulus vermicularis* in having the whorls of the left side rounded, not flattened, and there is a total absence of the "reamed out" appearance of *vermicularis*. The sculpture, also, is much coarser, especially by the presence of spiral lines, which are absent or only faintly developed in *vermicularis*.

Most of the specimens are white and bleached, but some material from a deposit 14 inches below the type layer had the epidermis well preserved. A large, fully adult shell of four whorls, 4.8 mm. in diameter, (pl. 8, fig. 17, No. 3984) had a grayish-horn epidermis and the growth and spiral sculpture were well marked. All specimens from this layer (layer 6, impure peat 75%) were well preserved with ashy-horn color.

Gyraulus cressmani was found abundantly in all layers containing mollusks and was associated with abundant material of *Valvata virens platyceps* Pilsbry, *Valvata humeralis densestriata* Pilsbry (some specimens varying toward *V. h. californica* Pilsby), described from the oil-bearing strata of the Kettleman Hills region, Kings Co., Cal. A few specimens of *Armiger imbricatus* (Müller) occurred with the Gyraulus, the first record of the occurrence of this genus in the west.

The species is named for Dr. L. S. Cressman of the University of Orgeon, who collected the material.

PARAPHOLYX PACKARDI CORRUGATA, new var. Pl. 8, fig. 19.

Shell of 3–3½ whorls, the spire flattened or slightly elevated, the body whorl very large; sutures not well impressed; aperture about as wide as high, rounded above, slightly angulated below; columella thickened by a heavy plait parallel with the axis; umbilicus closed or with a slight vertical chink; there is no evidence of a tooth on the columella as described for *packardi;* sculpture of coarse growth lines or of distinct, regular ribs evenly spaced; spiral lines showing faintly in some specimens.

H. 8.5; M.D. 10.5; L.D. 7.9; Aperture H. 7.0; D. 6.9 mm. Holotype. No. 3985.

H. 7.0; M.D. 9.0; L.D. 6.5; Aperture H. 5.0; D. 5.0 mm. Paratype. No. 3986.

H. 7.0; M.D. 9.0; L.D. 6.0; Aperture H. 5.2; D. 5.0 mm. Paratype. No. 3986.

Locality and horizon: North end Summer Lake, Lake Co., Oregon, from drilled well at depth of 1080 feet. Thought to be of Pliocene age. The locality is in a valley fill, and the exact horizon is difficult to determine accurately.

This form of Parapholyx appears to be related to *P. packardi* Hanna, described from Warner Lake beds in eastern Oregon.[1] It differs from this species in being smaller (*packardi* has a diameter of 13 to 19 mm.), the spire is more depressed and the costae are more constantly present than in *packardi. Corrugata* resembles some depressed forms of *packardi,* especially fig. 5, plate 2 of Hanna's paper. The umbilicus varies from nearly closed to widely open, as described for *packardi.* The costae of the new variety are visible on all specimens examined (about a dozen) and are conspicuous in young and immature shells.

The specimens were submitted for examination by Dr. Carl L. Huffaker, of the University of Oregon. The types of the Gyraulus and the Parapholyx are in the collection of F. C. Baker. Paratypes are in the Acad. Nat. Sci. Phila.

[1] Hanna, G. D., Fossil fresh water mollusks from Oregon contained in the Condon Museum of the University of Oregon, Oregon Univ. Pub., I, no. 12, pp. 22, 1922.

EXCURSIONS TO LAKE BAICAL

By W. J. EYERDAM

During the Russo-Japanese war, when I was a small boy, I had been much interested in reading about the Russians running the tracks of the Trans-Siberian railway across Lake Baical on the ice, to bring war supplies to the Far East. I was also intrigued in later years to read about the marvelous endemic biota of this deepest freshwater lake in the world which is over 500 miles long and nearly 6000 feet deep. Some of the oddities of the lake are the freshwater seals, freshwater codfish, huge Neptune's chalice sponges, *Veluspa baicalensis,* and the host of strange crustaceans, many of which are unlike any others in the world. Nearly all the over one hundred species of shells in the lake are endemic, including several endemic genera. Like the peculiar marine-like shells of Lake Tanganyika, the Baical shells are all distinctly freshwater species, but thin and fragile. The water is very clear, pure and cold, with very little mineral in solution.

About 100 species of fish live in the lake, of which about 90 per cent are endemic. The crustacean family Gammaridae, including hundreds of species, is notable for their bright colors, large size or bizarre shape of some forms.

The greatest mystery of all is the presence of seals in a freshwater lake thousands of miles from the nearest ocean. At one time there was an important seal hunting industry on the lake, but the rookeries have been heavily depleted. I have seen and compared specimens of the seals, *Phoca baicalensis,* with *Phoca caspica* in the Academy of Sciences at Leningrad and could note but very little difference.

Geologists have been at a loss as to which ocean Lake Baical has been connected with. Most of them believe that it must have been with the Sea of Japan, which if really the case would probably have been in Jurassic times and before the great masses of parallel mountain chains of the high Yablonoi and Stanovoi ranges could have thrown up their great barrier ramparts to the east. So far there has been insufficient evidence to support this theory.

My own opinion is that in Tertiary times there was perhaps

a great Mediterranean sea that connected the Atlantic with the Indian Ocean that extended as far as Lake Baical, leaving a chain of dry lake beds and brackish or saline lakes in its wake as the sea became landlocked. During the course of long lapses of time these bodies of inland waters fluctuated greatly in degree of salinity according to the supply of rainfall and drainage. Eventually nearly all of the lakes became brackish or salty again after the recession of the glaciers after the Pleistocene age when the vast area of Central Asia assumed a decidedly arid aspect. Since that time the drying up process of remaining lakes and the inland seas of Balkash, Aral and Caspian have proceeded at an ever more and more accelerated rate, but Baical has remained pure and fresh because of the melting snows of the mountains of the Bargozinian range and the rapid outflow of the Angara River into the Middle Tunguska, a tributary of the mighty Yenisei River.

I have never noted an opinion expressing this theory, but the presence of the almost identical species of seal in Baical and Caspian besides a similarity of many other forms of life should be pretty strong evidence to support this view. More conclusive evidence must await the discovery of the fossil remains of seals in the strata of some of the dry lake beds.

Dr. Benedict Dybowski was sent to Lake Baical and later to Kamchatka as a political exile about the time of our civil war. Although he practiced medicine, he was also a great naturalist and had ample opportunity to make extensive biological collections for the Academy of Sciences at St. Petersburg. Most of the endemic shells of Lake Baical were first collected and described by Dybowski. He died at Dorpat, Esthonia, at the age of 97 about 8 years ago. The genus *Benedictia*, a peculiar Baical shell is named in his honor.

The first time I stopped at Irkutsk to collect biological material in Lake Baical in 1928 I had just come from Manchuria via Alaska and Kamchatka with my friend Wm. F. Coultas. We had spent the summer in roaming the wilderness of central Kamchatka, climbing volcanos and collecting plants and birds. Later, we went to Manchuria which at that time was terribly infested by hordes of Hunhutz bandits. We spent a month in that coun-

try, mostly trying to get back into U.S.S.R. At that time it was an extremely difficult matter to get permission to travel in out-of-the-way places in Siberia or to stop at towns along the railroad. In six months of travel in Siberia we had not seen more than a half dozen foreign white men and those few had already become Russian subjects. I had an American passport which didn't help much because we didn't recognize the Soviets. In fact the only European consulate in Asiatic Russia at that time was the German consulate at Vladivostok, which represented all the white nations of the world. In spite of this formidable position the consul had almost no business except when an occasional non-Japanese ship sailed into the harbor of the Golden Horn. This was of course two years before the first Five Year Plan went into effect, when Stalin put the heat on the whole country and transformed it from a lethargic and completely wornout, threadbare condition, to a land of arsenals, munition factories, booming cities and colossal mass production to supply the mighty Red armies to insure the Communist state.

We were entirely on our own with no connections with any institution and the only money that we had was the little we had earned by helping to deliver the American cannery tender "Apex" to Kamchatka, plus one hundred dollars that I had brought from the states. My partner had only the money that he earned on the ship. My records of former work and activities in Kamchatka were preserved in the archives at Moscow and proved to be satisfactory. When we arrived in that far-off land I recognized many of my Russian friends when I was there in 1925. They gave us a great welcome, and upon my request to the president to be allowed to stop for the summer to collect biological material he immediately sent a telegram to Moscow, which is about seven thousand miles distant, to allow my partner and me to stay in Kamchatka. A few days later I received the permission from Moscow. I had been so sure of coöperation from the Kamchatka authorities that I had already made plans to go. The opportunity came when my good friend captain Albert Grove, with whom I had sailed over in 1925 on the auxiliary schooner "Apollo" came out to my home one evening, just after arriving from Chile. A few days later he told me that three

different jobs as captain had been offered him including the delivery of a ship to Kamchatka for the Soviet government. I then learned that it was to be the "Apex," upon which I had made a trip to Alaska on her maiden voyage many years before. I spent about half of one night trying to get Captain Grove to decide on accepting the Russian job, which he finally did. It proved to be the most memorable of his career, for he also landed in the hospital in Moscow, as I did, after many months of travel in Siberia, but I did not see him again after he left Kamchatka with the rest of the crew until I stopped at his home for a visit at Wheaton, Illinois, in 1931.

Before leaving Seattle I had put on board the "Apex" a large supply of biological collecting materials in anticipation of being allowed by the Soviet authorities to stay during the Summer to collect.

I collected over 500 species of plants in the region about Avatcha Bay and the volcanoes Avatchinskaja and Korjatskaja and the hot springs of Nuletchivo. These are all included in Hulten, "Flora of Kamchatka." Intensive search for Mollusca was made at all likely looking spots.

Late in September we were allowed free passage on the overcrowded "Indigirka" to Vladivostok via Hakodate, Japan. The "Indigirka" struck a rock in 1940 and went down with about seven hundred people somewhere along the Kurile islands.

After spending a month of travel in bandit-ridden Manchuria we finally got back into U.S.S.R. In one place we just missed Roy Chapman Andrews by one hour when he was returning from one of his Gobi Desert excursions. We did, however, meet Baron von Huenefeldt at Manchuli at 2 A.M. while waiting for the train. He had just arrived from Japan and was on his way home from his "first across the Atlantic from Europe" non-stop flight. Coming across Siberia in the winter caused his death of a cold. He died in Sweden a few weeks later.

The Soviet authorities had kindly granted permission to carry a camera, but warned us many times never to use it along the railroad or around military zones. We had been warned that such offense would be severely dealt with. In spite of this warning and in spite of the martial law that Siberia was under, my

partner could not resist the temptation of taking a snapshot from the train of the ruined town of Baical as we passed it. Counter-revolutionists had destroyed the town a few weeks before and there must have been quite a scrap, judging from the debris and the many hedges of barbed wire entanglements that extended down to the lake. The town was completely ruined and deserted. I protested to my partner, but he said there was no danger because nobody could see him.

As soon as we reached Irkutsk our passports and camera were seized by the OGPU and we were put under arrest but allowed to do as we pleased before the trial. We made the best of our time by visiting the professors at the university museum and at the biological station on Lake Baical, where they operate a deep-sea dredging boat with all kinds of equipment to collect the biota in the various habitats.

Four days later the chief of the Siberian OGPU had come fifteen hundred miles from Novosibirsk, the capital of Siberia, to preside over our trial because we were supposed to be important spies. We were taken into an inner chamber of a large wooden building and brought before the dreaded chief of the Soviet Cheka, a man of fierce and grim aspect. We were the first to be tried that morning, while outside of the door was a group of heavily guarded Mongols from the desert of Gobi that would be the next to be tried. Both Coultas and I expressed our admiration for the stoic and defiant attitude of these wild sons of the desert who would probably be sentenced to death or exile at hard labor.

As none of the Russians could speak English and my partner knew no other language, the judge held the trial in German, so I had to answer all the questions of the cross-examination and make all the explanations while my partner sat there without comprehending what was said during the whole time and never quite realizing the seriousness of his offense. The judge was as wily as a fox and tried his best to trap me in some question, but as we had nothing to conceal and had clear consciences I made light of the whole thing and treated it as a joke until the old judge finally decided that we were just a couple of blundering American naturalists and didn't know any better.

After about an hour of rigid cross-questioning the stern old

chief of the OGPU threw off his mask of grim expression and became very friendly. He asked me to give an account of our travels in Kamchatka and listened with intense interest about this remote land of over one hundred volcanoes with its great salmon fisheries, strange natives, numerous hot springs and vast areas of impenetrable alder and dwarf pine thickets which are accessible only by following the well-worn trails made by the huge brown bear which is more abundant here than anywhere else in the world. After asking a lot of questions about Kamchatka, which to the average Russian seems like the end of the world and a land of fascinating interest and mystery, he finally shook hands and said he felt honored to have met a couple of American scientists and would be pleased to be of service to us. He ordered our camera to be returned after destroying the films and as a parting gesture of good will he wished us well on our long journey and said "If at any time you find yourselves in difficulty please write to me, and if you should find yourselves hard pressed for money while in U.S.S.R. send me a telegram.

Some months later, when I was sick to the point of death in the hospital built by Napoleon near the Kremlin, I was given the best treatment that could be had by Dr. Maxim Zedkin, the son of Clara Zedkin, who at that time was second in command after Stalin. Dr. Maxim Zedkin was not only an outstanding M.D. but was also a zoologist. He had taught paleontology at the university of Munich and had written a book on the birds of the Caucasus, where he had carried on explorations. When I recovered from my sickness I was invited three time to the Kremlin as private guest of Clara Zedkin who at that time was past eighty.

Two years later, in November, 1930, upon my return from the Solomon Islands to Seattle, I went home the long way around and came over U.S.S.R. again, which was the fifth time in Siberia in six years. On the train between Chita and Lake Baical I had the pleasant surprise of meeting Mr. and Mrs. Jorgensen, whom I had met in Copenhagen at the house of Hans Schlesch, the well-known European conchologist, just as he was bringing a collection of land shells that he had gathered near the border of Dzungaria a year or two before. Mr. Jorgensen was the director of the Far East Danish Telegraph Company, which was one of the

few foreign companies that was allowed to operate in Asiatic Russian after the reign of the czar.

On this second visit to Irkutsk and Lake Baical I arrived at 3 A.M. and crossed the Angara pontoon bridge in a snowstorm without an overcoat and wearing oxford shoes that I had purchased in Papua. Indeed, during the thirty winter days that I spent in Siberia and ten in Russia on this trip, I wore the same clothes that I wore in Java and Singapore with the addition of an extra undershirt. However, in spite of the cold, I enjoyed tramping in the dry powdery snow and walking across some of the rivers on the ice. All of the rivers except the Angara were frozen over many weeks before. I had intended to buy some clothes in Vladivostok, but now at the start of the Five Year Plan it was almost impossible to purchase clothes, so I didn't get an overcoat until I got to Stockholm.

The object of my second visit to Irkutsk was to visit my Russian friends at the university and the biological station and to look over some of the Lake Baical collections. Again I was the guest of Dr. Jaznitsky, the specialist of Baical algae, and of Dr. M. Cajoff, specialist of mollusks. The man that I had wished to see especially was Dr. Shevyakoff, but he had died only a few days before.

The shores of Lake Baical are mostly rocky cliffs, and the descent into deep water is often abrupt. On some stretches of the coast, there are shallows which are quite rich in forms of invertebrate fauna. Many of these animals live under stones or adhering to the stones.

Both times when I visited the lake the deep-sea dredging boat was tied up for the winter. From the biological station, through Dr. Cajoff, I received the following species of shells which I have in my collection. All these shells are thin and fragile.

Pisidium (3 species), *Sphaerium* (1), *Choanomphalus* (8), *Benedictia* (3), *Valvata* (2), *Kobeltocochlea* (1), *Ancylus* (1), *Baicalia* (20). The various species were collected at from 2 to 40 meters depth, but one species of *Benedictia* at 150 meters.

IDA SHEPARD OLDROYD

The little group of pioneer conchologists of the West Coast lost one of its most active members with the passing, on July 9, 1940, of Ida Shepard Oldroyd, curator in the Department of Geology at Stanford University. Ida Mary Shepard was born at Goshen, Indiana, November 25, 1856. After graduation from the Saline, Michigan, high school, she attended the University of Michigan as a special student in science and received a teaching certificate. In 1888 her family moved to Long Beach, California, where she began the accumulation of the shell collection which, merged with that of Tom Shaw Oldroyd through their marriage in September, 1895, grew to be one of the largest private collections in California. This collection, highly praised by Dr. W. H. Dall, who through the years had studied and identified much of the material in it, naming one new genus and several new species in the Oldroyds' honor, was sold to Stanford University in 1917.

In 1916 the Oldroyds moved to Stanford University to catalog the Hemphill collection of shells, which had been purchased for the Geology Department by a group of alumni under the leadership of Dr. Ralph Arnold. A year later the University arranged to buy the Oldroyd collection and appointed Mr. and Mrs. Oldroyd to the positions as curators which they held during the remainder of their lives. Always zealous collectors, the Oldroyds continued their field work by spending several summers at Puget Sound and by making two trips abroad; thus they added to the size and quality of the Stanford collection and by their example stimulated others to do likewise. Donations from students of the University, gifts from friends, exchanges, and purchases by the Department at Mrs. Oldroyd's suggestion, all contributed to make the Stanford University conchological collection outstanding. As an example might be cited the acquisition of the Sarah Mitchell collection of Philippine shells in 1930; this huge collection came to the University at the earnest solicitation of a Stanford graduate, Dr. A. W. Herre, then a member of the Philippine Bureau of Science and an intimate friend of the Mitchell family. Presentation was made by Mrs. Burkholder, daughter of the collector, through Mrs. Oldroyd, whose arrival in Manila on a round-the-

world trip expedited arrangements for shipping some two tons of shells across the Pacific Ocean.

Mrs. Oldroyd was the author of several short papers in THE NAUTILUS, describing new mollusks. Her principal publications were "Marine shells of Puget Sound and vicinity" and "The marine shells of the West Coast of North America," the latter in four volumes; in these works she compiled descriptions of the two thousand species of mollusks known from the West Coast and supplied many excellent illustrations.

One of the early members of the Conchological Club of Southern California, Mrs. Oldroyd maintained an interest in the Club and was an honorary member until her death. She was a charter member of the American Malacological Union, of which she was vice-president in 1934 and honorary president from 1935 to 1940. She was also a member of the Conchological Society of Great Britain and a corresponding member of the Peking Natural History Society.

A picture with her husband, Tom Shaw Oldroyd, appeared in THE NAUTILUS, vol. 46, 1933, p. 108.—*Prepared by members of the Conchological Club of Southern California.*

The portrait is from a photograph in the Branner Library, Stanford University, which we owe to the courtesy of Chancellor Ray Lyman Wilbur.

NOTES AND NEWS

SOME RARE CALIFORNIA SHELLS.—We have been finding some very interesting and rare shells off White Point (near San Pedro, California). These shells have been collected within the last year, such as *Tritonalia interfossa minor* Dall, *Tritonalia beta* (Carpenter) Dall and *Moniliopsis grippi* Dall. The above shells had to be sent to the National Museum for classifying because they had not been found around here in years, and do not appear in many of the older collections. We also picked up fifteen *Murex santarosana* Dall. This has been dredged recently off Redondo, but is rare even in the dredgings. The war has stopped most of the collecting now, and our favorite spot, White Point, has been closed; but we are hoping that after the war is over the shells will be there in abundance. We are members of the Long Beach Shell

Club and the Los Angeles Club.—MR. AND MRS. RALPH BORMANN, RALPH BORMANN, JR.

THE SCULPTURE OF INAEQUIVALVE MOLLUSKS.—A very interesting point about the sculpture of those bivalves in which one shell valve overlaps the other one wholly or in part along the ventral margin is the difference between the sculpture on the two halves. Among the Corbulidae there are many examples of this condition. In *Corbula philippii* Smith we find the left valve large and with a heavy concentric sculpture while the right one is considerably smaller and exhibits a feeble radial sculpture, its concentric markings being little more than inconspicuous growth lines. *Corbula sulcata* Brug. from Senegal shows a somewhat similar condition. In this species the larger valve has a very heavy concentric sculpture and the smaller one, while retaining this type of ornamentation, has it in much less degree. The extent of the inequality between the valves has some influence on this character and those species which show little difference such as *C. contracta* Say and *C. caribaea* d'Orb. also show but slight variation between the sculpturing of the two halves. It must be admitted that this is not universal among the corbulas, as some species which have a fair amount of inequality do not show any marked difference in sculpture, but the extremely inaequivalve ones do seem to exhibit this type of difference. The most interesting example of this condition, however, is that furnished by *Arca incongrua* Say. Here the inequality, and consequent overlapping of the ventral margins, does not extend along the whole lower border of the shell but begins about one-third of the way back from the anterior end. Forward of this point the valve margins meet in fairly close apposition and the nodules on the ribs, which are so typical of this species, are to be found on both valves. In the region where the larger valve begins to overlap the smaller one, however, a very remarkable change takes place. The ribs of the larger valve retain these rib nodules just as they are found on the anterior part of the shell but the ribs on the smaller valve become entirely smooth and remain so until at the very posterior end there is found another small area where the margins of the valves are in close apposition and in this area the rib nodules are again to be seen. Thus the left, or larger, valve has all its ribs bearing these nodules while the right, or smaller one, has an area, correspond-

ing exactly with the area in which it is overlapped by the left valve, in which the ribs are smooth and these nodules are entirely lacking. Apparently certain dynamic forces either of the environment or of the animal itself induce the formation of this beaded type of rib by acting on the edge of the shell as it is being formed along the margin. When this free edge is covered and protected by the overlap of the other valve these forces can no longer be brought to bear on this particular area and the bead-like nodules are no longer produced. These few observations and speculations do not solve much but they are presented in the hope that they may help to throw some light on the perplexing problem of the external sculpture of bivalve mollusks.—Richard A. McLean.

Additional Utah Records.—A number of specimens of *Columella alticola* Ingersoll were taken while collecting along the head of Mammoth Creek, southwest corner of Garfield County, Utah. They were found under pieces of rotten wood in well shaded places within a rather closely restricted area where the road diverges from the creek and turns south. The altitude at this point was about 8,000 feet. Associated with it were *Oreohelix strigosa depressa* Cockerell, *Microphysula ingersolli meridionalis* Pilsbry and Ferriss, *Vallonia gracilicosta* Reinhardt, *Pupilla blandi* Morse, *Pupilla hebes* Ancey, *Vertigo gouldii arizonensis* Pilsbry and Vanatta, *Discus cronkhitei cronkhitei* Newcomb, *Vitrina alaskana* Dall, *Zonitoides arborea* Say, *Euconulus fulvus alaskensis* Pilsbry, *Deroceras gracile* Rafinesque and *Succinea avara* Say. In the stream I found *Stagnicola bulimoides techella* Haldeman.

Retinella electrina Gould brings the known molluscan fauna of Zion National Park to twenty-three species and subspecies. Four specimens were taken at "Saddle Nook." Another specimen of *electrina* was taken along the head of Deep Creek about twelve miles north of the park boundary.

Pisidium concinnulum Sterki from Cedar Breaks National Monument and previously referred to[1] has been definitely identified by Dr. Stanley Brooks.

[1] Nautilus, 54: 117. 1941.

A fauna found along North Fork of Asay Creek, Garfield County, proves interesting. There I found *Vallonia cyclophorella* Ancey, *Vallonia gracilicosta* Reinhardt, *Vallonia perspectiva* Sterki, *Pupoides hordaceus* Gabb, *Pupilla blandi* Morse, *Discus cronkhitei cronkhitei* Newcomb, *Vitrina alaskana* Dall, *Zonitoides arborea* Say, *Euconulus fulvus alaskensis* Pilsbry and *Hawaiia minuscula neomexicana* Cockerell and Pilsbry.—Wendell O. Gregg.

Living Mitra florida.—The specimen reported in Nautilus, Oct., 1941, p. 45, was not the first one taken alive. In our expedition of 1940 we took two specimens off Eastern Dry Rocks on April 10th, one large dead one, now in my collection, and a small living one. It was identified in Washington as *M. fergusoni* Sowb., now admitted to be the same as *M. florida* Gld.—Jeanne Schwengel.

Canadian Snails.—An illustrated account by Mr. John Oughton appeared in Canadian Nature (Toronto) for March and April.

The Bahama Conchological Society.—On the 15th of March, 1941, a group of interested persons, at the home of Mr. and Mrs. Gerald W. Birks, organized the first Conchological Society in the Bahama Islands. The objective was to make a complete collection of the shells, coral and marine life of Bahama waters, and ultimately to establish a permanent public marine museum in Nassau. Sixteen persons became charter members and elected: Rev. Paul D. Ford as president, Mr. Bryn Johns as vice-president, Mr. Oris Russell as secretary-treasurer. One of the somewhat rare shells of the Bahamas, *Strombus gallus* L. (The angel-wing conch), was chosen as the emblem of the society. Meetings are on the third Monday evening of each month. An exhibition of local and foreign shells was held at St. Andrew's Hall on March 5th and 6th, 1942. The Duchess of Windsor kindly consented to open the exhibition to members of the Society on the first day, and the general public was welcomed later. Over 500 species of Bahaman shells were shown by 18 exhibitors.

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EDITORS AND PUBLISHERS
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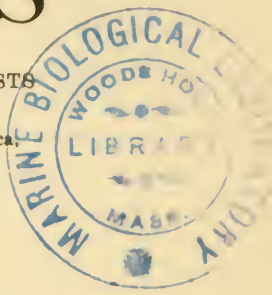

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